

Egyptian Core-Glass Vessels Of The New Kingdom:
Manufacture And Significance.

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Abstract

The principal aim of this thesis is the evaluation of the social significance of core-glass vessels in the Egyptian sphere of influence in the later New Kingdom, based on the technology, typology and distribution of the vessels.

To assess the technology involved, the assemblage of manufacturing debris from Amarna was catalogued and examined. This material was then used to assess the potential techniques employed. The evidence suggests that a number of methods were used to form vessels, with trailing on, coating in powdered glass and press moulding, probable techniques. This was reinforced by an evaluation of the incidence of different colours of glass in this debris and their use as either background or decorative colours.

X-ray examination of the internal structure of the vessels, while inconclusive, also supports the existence of a number of different techniques.

Finally, contextual analysis of the debris from Amarna shows a close connection with royal activity.

These points support the widely held suggestion, that core-glass vessel production was a royal monopoly.

As a basis for typological studies, the vessel fragments from Amarna and Gurob were catalogued. There were two main areas of investigation. First, the evaluation of the vessels as chronologically sensitive. Both conventional stylistic analysis, following Nolte, and quantitative analysis based on the decorative features, show that the vessels are not good indicators of chronology.

The second approach compares the vessels in terms of their attributes to vessels in other materials. There is a consistent association of glass vessels with features of vessels in other materials, which are either imports or Egyptian luxury vessels. This further reinforces the ascription of high status to the vessels.

The distribution of the vessels was first examined at an intra-site level for Gurob and Amarna. At both sites, contextual analysis based on the broad context type, structural elaboration and the associated artefacts, indicate a close connection with royal activity. This study was extended to cover the 3 main areas of Egyptian influence in the New Kingdom: the Nile Valley, Sinai and Syro-Palestine. The evidence from these areas in terms of contextual analysis indicates that the vessels maintained their high status and royal connection cross-culturally.

Finally, it appears that the social function of vessels underwent a shift post-Amarna. During the Amarna period an expanded industry seems to have been used to provide items of personal reward from the court. In D19, they seem to become symbols of domination via the institutions of political control.

I declare that this thesis has been composed by me, and
is my own work.

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Introduction

While scattered instances of glass are known prior to the start of the Late Bronze Age (LB) (Oppenheim et al 1970, Mc Govern 1987), it is only from this period that glass seems to have been deliberately produced. Vessels represent the most complex artefacts manufactured in glass in this period. Their production required varied, and often rare, raw materials and a high level of technical knowledge, skill and organisation. A study of these vessels, then, is of fundamental importance to an understanding of the technology of Late Bronze Age glass production. In addition, the archaeological significance of the Egyptian glass vessels has never been fully evaluated, with previous studies primarily concerned with largely typological considerations. This thesis attempts to integrate the divergent information from typological, compositional and contextual studies to better understand the social significance of core-glass vessels. Glass vessels provide a valuable opportunity to evaluate the role of luxury production in Egyptian society not provided by other materials which were extensively recycled, such as metals, or subject to decay such as textiles.

As with most technological innovations, the exact origin of glass vessel manufacture is uncertain. It seems probable, however, that this industry evolved in

the Hurri-Mittanian sphere of influence in Northern Syria-Mesopotamia in the 16th century B.C. (Oppenheim et al 1970, Vandiver 1983, Mc Govern 1991). The earliest glass vessel fragments from Egypt are from the reign of Tuthmosis I, but it is with the reign of Tuthmosis III that the introduction of glassworking as a craft is clearly identified. Given the extensive military campaigns of this pharaoh it seems probable that the first glass-workers in Egypt may have been captive craftsmen. Certainly it seems probable that glass would have been taken as tribute, and several authors have tried to identify it in the lists of Tuthmosis' spoils from his campaigns (Glas., 7-9). By the reign of Tuthmosis IV, Egyptian core-glass vessels had developed a distinct cultural style, and production in Egyptian manufactures may reasonably be inferred. The following period, from Amenophis III to Akhenaten (Amenophis IV) saw the floruit of the core-glass industry in Egypt, both in terms of the level of output and technical accomplishment. Core-glass vessels continued to be produced in Egypt until the 21st Dynasty, but the achievements of the later 18th Dynasty had already declined by the 20th Dynasty. It is with the period of the mature industry that this study is concerned , rather than with its origins or decline. In Egyptian terms this period is bracketed by the reigns of Akhenaten and Ramesses III, while within the broader terms of the Eastern Mediterranean this period is

considered coeval with the Late Bronze II period as represented by differing local nomenclatures.

Previous work on Egyptian core-glass vessels may be broadly divided into three loose categories; typological studies based on the stylistic traits of the vessels, methods of manufacture, and compositional analysis. The first comprehensive study of Egyptian core-glass vessels as a distinct artefact class was by Newberry (Newberry 1920). He identified many characteristics of the vessels (for instance their skeumorphic association with stone vessels) which have greatly influenced all later discussions. The next significant typological study was that of Fossing (Fossing 1940). His greatest contribution was the identification of two distinct regional groupings of Mesopotamian and Egyptian type vessels. He also provided evidence of the diffuse distribution of glass vessels throughout the Eastern Mediterranean. The final major contribution to typological studies of the Egyptian vessels was Nolte's (Glas.) establishment of a chronological framework for the dating of the vessels based on their stylistic traits. In addition Nolte's identification of the vessels with a series of "workshops" has greatly influenced conceptions of the organisation of glass vessel production and the distribution of the vessels. In addition to these typological studies mention must be made of the contributions of Harden (Harden 1981) and Cooney (Cooney 1976) to the study of Egyptian vessels in

their cataloguing and systematic description of core-glass fragments, in particular the extensive collection of the British Museum.

The first attempt to explain the manufacture of core-glass vessels was Petrie's (TEA 25-6) account of the debris from Tell el-Amarna based on his visual examination of the fragments. Although Petrie correctly interpreted the importance of forming the vessels on a core, many of his suggestions were erroneous. Lucas (1948, 210-20), in his classic study of Egyptian industries, largely reiterates Petrie's position, although with more detail on the raw materials.

In the 1950's Turner (Turner 1954 and 1956a-d) published the seminal papers on the technology of Egyptian core-glass vessels based on compositional data. These studies form the basis of our understanding of the formation of glasses, and the working properties of LB glass. His studies, however, did nothing to resolve the problem of the method(s) used to apply the glass to the cores to form vessels. In the 1960's, a series of attempts were made by Schuler (Schuler 1962) to evaluate different potential methods for the formation of vessel bodies. His proposed method was that the vessel bodies were 'cast on' to the cores using multi-part moulds. Further replication studies by Labino (Labino 1968) demonstrated that the most likely method to have been employed was the trailing on of molten glass rather than any of Schuler's more elaborate proposals. Thus, current

understanding of the manufacturing method(s) used rests primarily on replication studies which have been largely divorced from the artefactual evidence.

The scientific advances of the 1960's and '70's, particularly the pioneering of accurate compositional analysis based on essentially non-destructive techniques have generated much information on the constituents of Egyptian glass. Research into the composition of glass has tended to concentrate on the colourants and opacifiers used, primarily due to the inability of most of the methods employed to detect the light elements which constitute the bulk composition of the glass. Foremost amongst the glass analysts has been Brill (see Oppenheim et al 1970), and his work is instrumental in showing the complex nature of Egyptian glass. A further study which must be mentioned is that of Kaczmarczyk and Hedges (Kaczmarczyk and Hedges 1983) which, although based on a study of faience, presents an integrated study of the implications of vitreous technology, particularly with reference to the sources of, and trade in the metals used as colourants.

The author's own interest stems from a fascination with the vexed question of the formation of the vessel bodies. In 1987, the opportunity arose to examine a previously uncatalogued assemblage of glass attributed to Petrie's 1904-05 work at Serabit el-Khadem (Simpson 1990). It was hoped that this collection would contain either manufacturing debris or pieces indicative of the

methods used. Unfortunately, this was not the case, and although the study proved valuable in itself, its main purpose remained unfulfilled. In addition, it raised a series of further questions concerning the Egyptian glass vessel industry. Firstly, it became apparent that Nolte's framework for the dating of vessels was virtually useless in assigning fragments to any specific period, with its major divisions based on morphological features. Secondly, the presence of glass vessel fragments both at Serabit el-Khadem and the more recently excavated site of Timna (Rothenberg 1988) seemed to present a hitherto unnoticed phenomenon, the association of glass vessels with remote mining sites and their attendant temples. In the absence, however, of any examination of the distribution of vessels within Egypt, it was possible to offer only a tentative hypothesis as to the explanation of the presence of the vessels at Serabit el-Khadem and Timna.

This thesis started with the intention of clarifying these three issues: an expansion of Nolte's typological framework; a re-examination of the available evidence concerning manufacturing methods and finally an evaluation of the distribution of glass vessels in the LBII period.

Starting from the premise that Nolte's framework was essentially correct, the author sought to incorporate the fragments from Amarna and Gurob into her scheme. These two sites were selected for study for

several reasons. Firstly, both sites were used as 'type' sites by Nolte to define the two workshops (Nolte's "Werkreiss 3 and 4") which cover the period under discussion, and so it was essential to be familiar with this material. Moreover, it was hoped that it would be possible to broaden Nolte's framework by the incorporation of these fragments. Secondly, Nolte had used these sites because both had produced a number of glass vessels within a closely dated range. This means that each assemblage represents a distinct group, and thus stylistic differences could reasonably be viewed as reflecting chronological development and/or disjunctions. On a practical note, glass from both Amarna and Gurob is extensively represented in museum collections in Britain, and while it is not all the glass, it may be treated as a representative sample of the fragments from the two sites. Finally, as both Amarna and Gurob are credited with evidence of glass production, it was also hoped that material might be present in the collections which would elucidate the manufacturing method(s) used.

An examination of this evidence, however, raised further problems. It proved impossible to accommodate the fragments within Nolte's framework, thus drawing her conclusions with regard to typology into doubt. A preliminary attempt was made to establish an alternative basis for the typological assessment of Egyptian core-glass vessels but unfortunately a complete

reassessment of Nolte's scheme is out with the scope of this thesis. In particular, it was not possible for the author to examine the el-Lisht and Malqatta vessel fragments, which are currently being prepared for publication. The author also doubts that such a study would justify the input required, and that Nolte's typology provides an adequate descriptive basis from which to work. In this work, typological studies are used to assess the function and symbolic associations of glass vessels. In this usage, Nolte's standardised descriptions remain of fundamental importance.

The vessel fragments were examined visually for signs of manufacturing techniques and, not unexpectedly, the evidence suggests that a number of methods were used. In addition, twelve fragments were X-rayed in an effort to understand the formation of vessel bodies, and these too tend to support the existence of several techniques. Finally, an estimation was made of the social implications of manufacturing techniques and the resulting status of the finished vessels. The use of rare raw materials, the level of skill and the pyrotechnology involved all suggest that glassworking must have been relatively restricted. Indeed, most writers have accepted that glass vessels represent 'royal' products (in particular Glas. and Kaczmarczyk and Hedges 1983, 247). Such a suggestion, while having much to commend it, has never been seriously tested, and the status and function of the vessels rests largely on

conjecture. The distribution of the workshop debris at Amarna as represented in the published evidence was examined at a 'single context' level in order to test this assumption. The published evidence was also used to estimate the social status of the contexts containing vessels at both Amarna and Gurob. Despite the deficiencies of the published evidence, these two sites do seem to confirm that glass vessel production was essentially a royal monopoly. The distribution of the vessels indicates that they were primarily personal possessions with an intrinsic high status. In simplistic terms, it seemed possible that these vessels may be used as markers of court contact.

These hypotheses were then tested with reference to the wider distribution of glass vessels in Egypt. While Nolte (Glas.) provides the known provenances of complete vessels, again this work includes the fragmentary examples. It also presents the information in terms of their distribution, as opposed to Nolte's chronological approach. A sample of Egyptian sites was examined, and while there are deficiencies in the evidence, it does suggest that vessels are principally to be linked to higher status individuals. The exact relationship of these individuals to the court is, however, uncertain. The distribution of the vessels does seem, at least in one way, dependent on court ideology. This is apparent in the massive expansion of vessel production under Akhenaten, with a subsequent contraction in the

following period. These changes may be linked to the redefinition of the king's role in this turbulent period.

Outside Egypt there are three principal areas which have produced Egyptian glass vessels; Sinai, Syro-Palestine and Cyprus. While the original intention was to study the evidence from all these areas, it was, unfortunately, necessary to exclude Cyprus as beyond the practical limits of this thesis. While in Eastern Syro-Palestine, the distribution of the vessels was consistent with their restriction to high status individuals, as in Egypt, in Western Syro-Palestine and Sinai a different distribution was present. In these areas, vessels are primarily represented as temple goods, in relatively high concentrations within a single context. These divergent distribution patterns are to be explained with reference to the political influence exerted by Egypt, whether directly via institutions or via an autonomous élite. Thus the vessels serve as potential markers of the form of political control exercised by the Egyptian court in the later 18-20th Dynasties.

General Description of the Amarna Glass Working Debris

There are other glass working sites in the Late Bronze Age which have produced manufacturing debris; Malqatta (Keller 1983) in Egypt and Nuzi (Vandiver 1982b, 1983) in Iraq for example. Amarna, however, is significant in the quantity and range of the glassworking debris. Moreover, from Petrie (TEA) onwards, it is the Amarna material which has dominated the views advanced as to the manufacturing methods of the glass industry. Before describing the broad features of the glass debris, it is worth making two points. Firstly, the material here is only a sample of the total evidence of glass working and rests largely on the Petrie Museum collection, with supplementary material from other collections, notably that of the Ashmolean Museum. Although there is more Amarna manufacturing debris held in other museums [1], the sizable collection of glass debris in the Petrie Collection gives it a high potential to be a representative sample. Secondly, while later chapters will deal more specifically with core formed glass vessels, it should be noted that the glass working debris undoubtedly represents several different aspects of the glass and glazing industries at Amarna.

[1] There is, for example, further material in Bolton, Liverpool and Manchester Museums, but only held in small quantities.

There are seven broad categories of material form represented in the Amarna glass working debris; frit lumps, blobs, pincer fragments, blocks, flakes, rods and canes.

I Frit Lumps

Table 2.1 Frit Lumps Colours Represented

Colour	No.	% [2]
Dark Blue	32	78
Turquoise	8	20
Red	1	2
Total	41	100

Although Petrie (TEA 26) considered frit the first stage in the manufacture of glass, given its composition (frit is a double silicate of copper and calcium (Dayton 1978, 31)), Kaczmarczyk and Hedges (1983, 214) have stated that "the composition of Egyptian 18th Dynasty glass is not compatible with that of the frits." It now seems probable that the frits were primarily produced as pigments (ibid). Given that the possibility still exists that the frits were produced as a product of the vitreous industries, it is worth noting the

[2] The percentage figures given are based on the number of pieces represented.

characteristics of this material. Frit is represented by lumps often quite regularly shaped, composed of partially fused, but not vitrified material. Frit occurs primarily as either dark blue, representing the majority of pieces (see Table 2.1), or turquoise, with, in addition one red frit lump (*1 UC Unnumbered)[3].

II Blobs

Blobs, as their name implies, have no standard shape, and vary widely from the almost regular small pearls of glass, or lenticular shapes (eg. *9 Ash 1893 1-41 (403)) to a very irregular nodular appearance as in the example illustrated on Fig. A12 (*7 Ash 1893 1-41 (403)). All the colours identified in the Amarna glass are represented in the blobs (see Table 2.2). Dark blue is the most favoured colour, with turquoise the

[3] Numbers preceded by an asterisk in the text refer to examples listed in the catalogue. The catalogue is arranged primarily by the form of material. Then the individual forms are listed by colour in the following order; opaque dark blue, translucent dark blue, turquoise, white, yellow, black, red, clear, brown, purple, green and mixed. Finally, the glass is ordered by museum number. The asterisk numbers have been assigned by the author consecutively from the start of the catalogue.

Table 2.2 Blobs Colours Represented [4]

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
Number	78	35	17	6	12	2	8	6	2	1	37	204
%ge	38	17	8	3	6	1	4	3	1	<1	18	100

second most popular single colour [5]. A high proportion of the blobs are of mixed colours (18%). The wide variation in the form of the blobs and the high incidence of multi-coloured pieces may mean that they are representative of a number of different stages in the manufacturing process. Some pieces certainly represent the early stages of glass production, for example *5 UC 22922 where individual particles of silica are still visible. Others, however, such as *8 Ash 1893 1-41 (403) which is composed of trailed rods, may represent either the addition of glass as cullett to the

[4] The following abbreviations for the colours of glass are used in the tables in this chapter:- B - dark blue, T - turquoise, W - white, Y - yellow, BK - black, R - red, C - clear, BN - brown, P - purple, G - green and M - mixed/multi coloured.

[5] N.B. Although the writer does occasionally use the term "light blue" in the catalogue, in this consideration light blue glass is included with the turquoise glass. Where the distinction was already made in the catalogue, it has been maintained.

initial batch (cullett is previously formed glass which is ground up and added to the other raw materials to facilitate their fusion) or a later stage of working such as trailing, which may have failed. With a few exceptions, such as *2 Ash 1893 1-41 (403), the glass is well fused and free of bubbles. Although some pieces have a layer of white weathering, most of the glass under discussion (ie. all the forms of debris) are largely free from weathering. Finally, in keeping with much of the "primary" glass production debris (blobs, blocks and flakes) there are often distinct layers of semi-fused material adhering to the glass as in *3 UC 22922. (These layers are described more fully below.)

III Pincer Fragments

Table 2.3 Pincer Fragments Colour

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
Number	22	20	10	6	16	3	10	13	6	4	5	115
%ge	19	17	9	5	14	3	9	11	5	4	4	100

While the glass was molten, trails were taken from it and these constitute the pincer fragments. There are two main reasons why trails were taken from the molten glass. Firstly as test trails to check the consistency of the glass both with respect to its viscosity and the colour of the glass. It is important to appreciate that

glass is primarily worked in a molten or plastic state, and that its viscosity is of crucial importance to its potential to be re-shaped. In an age apparently before the standardised production of glass, it was only by taking such trails that the viscosity could be assessed. Secondly, it is possible that glass was wound directly on to a punty to form objects by a process of 'winding on' as described by Labino (Labino 1966) although such a process fails to account for the flattened ends of many of the pieces. Fig. A12 illustrates two 'typical' pincer fragments (*12 UC 22923 and *13 UC 22923) with the characteristic flattened, circular end where pincers have been applied and the rectangular section tail. Again (see Table 2.3), all the colours of glass are represented in the pincer fragments, and, again dark blue is the most frequent colour. Unlike the blobs, however, mixed colours in pincer fragments, eg. *16 UC 22921, are relatively rare with only 4% of the total.

While nearly all of the glass is well fused one piece, *14 UC 22923, has unfused particles remaining in the matrix. This would seem to support the suggestion (TEA 26) that the pincer fragments are primarily test trails taken from the crucibles to assess the glass. Finally, some of the examples of pincer fragments, eg. *11 UC .110 show faint parallel marks, here described as striations [6] which may be the result of the stretching

[6] Throughout this work the term 'striations' (over/)

of the glass while molten. In one example, *15 UC 22911b, these stretch marks have become relatively deep grooves in the pincer fragment's tail. The pincer fragments are free of any secondary layers of semi-fused material.

IV Blocks

Blocks may be characterised as roughly cuboid in shape as shown in Fig. A12 by example *17 Ash 1893 1-41 (403). Not all, however, are so regularly shaped with many having broken edges for example *36 Ash 1893 1-41 (949), and some with round edges (eg *28 UC 25043. It is probable that blocks, and the flakes described below, represent glass which has been formed in the crucibles prior to reworking. Given Petrie's (TEA 24-25) observation that the glass was chipped from the

Table 2.4 Blocks Colours

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
Number	28	13	2	1	4	3	4	2	5	3	5	70
%ge	40	19	3	1	6	4	6	3	7	4	7	100

[6](contd.) refers to such faint marks, similar to light scratches. This term should not be confused with 'striations' as used by Harden (Harden 1981, 28) to describe marks found only on vessels.

crucibles, this would explain the broken edges and conchoidal fractures on both the blocks and flakes. (In later discussions, these two types will be grouped together as representing the same product of the glass industry.) Again (see Table 2.4), all the colours of glass are represented, with dark blue the most frequent colour. (Plate 1 illustrates some of the colours represented in the 'primary' material.) As with the frit and blobs, there are examples with semi-fused layers adhering to the glass (eg. *20 UC 22909a).

Interestingly, 3 blocks (*22 UC 22909, *25 UC 3645A and *27 UC 22922) have a layered structure comprising fused, semi-fused and poorly or unfused material and these may represent the waste from a poorly fused initial batch. While most of the glass is well fused, certain examples (eg *29 UC 8979A) are poorly vitrified, or contain unfused material (eg *23 UC 22909a). In addition some of the blocks include large air bubbles in the matrix (eg *31 UC 22922). It is worth observing that while most of the blocks have fairly regular and flat surfaces, occasionally there are signs of the addition of further material to the blocks while molten, for example *34 UC 22917a, where rods have been fused in to its surface. Two of the blocks (*21 UC 22909a and *32 UC 22919a) have been pierced or perforated, probably while the glass was molten as the edges of the perforations are slightly rounded. Taken in conjunction with the parallel concentric marks on *33 UC 22909a and *28 UC 25043, it

seems that some of the blocks have been twisted. Finally, there are 4 examples of glass blocks with mixed colours, which seem to represent blocks largely of one colour with slight contamination by another. In addition there is one example *37 UC 22939 of a deliberately manufactured mosaic composition block. It seems probable for reasons discussed in the following chapter, that this mosaic block does not represent primary crucible waste, but rather secondary re-working of the glass.

V Flakes

The flakes have been classified in to two categories, thick angular flakes and flat flakes, but there is no distinct separation point between the two types. Angular flakes tend to have a triangular profile as represented for example by *49 Ash 1893 1-41 (403), while flat flakes tend to have either a flat profile, as shown by *53 Ash 1893 1-41 (403) or a very shallow triangular section. Flat flakes are more common than angular flakes (see Table 2.5), but both probably represent the removal of glass from larger blocks either by the use of a chisel or other tools as most show some signs of fracture marks. There are, however, a few which do not exhibit such marks, eg. *38 Ash 1893 1-41 (403) and *54 Ash 1893 1-41 (403), which are both 'flakes' of glass composed of two pieces of glass pressed together when plastic.

Table 2.5 Flake Characteristics

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
Angular No.	57	11	13	2	12	0	8	9	9	4	14	139
" %	28	12	46	40	46	0	14	16	33	36	42	26
Flat No.	144	76	15	3	14	10	50	46	18	7	19	402
" %	72	88	54	60	54	100	86	84	67	64	58	74
Total No.	201	87	28	5	26	10	58	55	27	11	33	541
" %	37	16	5	1	5	2	11	10	5	2	6	100

As flakes seem to be related to blocks it is not surprising that they show many of the features of the blocks. All the colours of glass are again represented, and dark blue is the most frequent colour. There are examples of perforation (*41 UC 22930), stretching while molten (*42 Ash 1893 1-41 (403)) twisting marks (*50 UC 22922) and the incorporation of bands of material at different stages of fusion (*40 UC 22922). One piece, *39 UC 22909a, is of particular interest in that it may bear the impression of the internal surface of the crucible in which it was made (discussed more fully Chapter 3). There are two features represented by the flakes that are not present in the blocks that deserve mention. First, is the presence of flakes composed of distinct bands of different colours of glass such as *57 UC 22919a, these are not matched in the 'mixed' blocks. Furthermore, there are two cases of the use of translucent red glass, *52 UC 22921 and *58 UC 22921, a

very rare colour in Egyptian glass. Finally, as with the other "primary" manufacturing debris, flakes often have semi-fused layers adhering.

VI Semi-Fused Layers Adhering To 'Primary' Debris

A feature of the frit lumps, blobs, blocks and flakes is the presence on over a quarter of the pieces of a subsidiary layer of semi-fused material adhering to the glass (see Tables 2.6 and 2.7). This layer is entirely absent from the rods and canes, and it may be related to the fusing and melting of glass in the crucibles. The semi-fused layer is composed of white silica-like material in 78% of the examples, but other

Table 2.6 Presence Of Layers By Form Of Debris

Form	Frit	Blobs	Blocks	Flakes	Total
Total	41	204	70	541	856
No. with layers	7	32	20	164	223
% with layers	17	16	28	30	26

Table 2.7 Presence Of Layers By Colour

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
Total	339	141	47	17	42	16	70	63	34	15	75	859
No. layers	98	41	10	3	7	6	16	35	4	2	10	221
% layers	29	29	21	18	17	38	23	22	12	13	13	26

colours of layer, grey, black, red, green and yellow also occur. In addition there are sometimes thick layers composed of different types of material. Table 2.7 shows that such layers are present on all the colours of glass at Amarna with its highest incidence on red glass and its lowest incidence on purple glass.

VII Rods

Table 2.8 Rods Colours

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
No.	1342	698	471	251	235	27	143	285	349	291	94	4186
%	32	16	11	6	6	1	3	7	8	7	1	100

Table 2.9 Characteristics Of Rods

	Plain	Striation	Groove	Tapering	Perf.	Total
No.	2 182	1 565	492	330	136	4186
%	52	37	12	8	3	100

There are significantly more examples of rod fragments than any other form of manufacturing debris. Rods are, in general, circular section extended strips of glass as illustrated in Fig. A11 by *80 UC 22924. (A selection of rods is illustrated in Plate 2.) Rods of glass were used for a number of different purposes. Certainly they were used to form beads, as attested at

Amarna by the find of rods wrapped around copper wire (TEA 24-25). They were also used as inlays both for furniture and in architecture. They were also used to form decorative elements of the vessels (see Chapter 4) and it has been suggested (Labino 1966), that they may have been used to form vessel bodies. All the colours of glass are represented in the rods (see Table 2.8), with dark blue the most frequent colour. While nearly all the rods are cylindrical, there are a few examples of rods with differing sections; semi-circular (*75 UC 22909a), elliptical (*81 UC 22925), and triangular (*72 UC22909a). The ends of the rods have usually been snapped clean, but 8% of the rods have a tapering profile, possibly indicating stretching. Certainly, the trailed rod fragments, such as *67 UC 22909a, are typical of rods which have been stretched while plastic, with curved tapering tails. Similarly, the ends of other rods have been bent round or flattened, as in *78 UC 22910b, showing that the rods were manipulated while plastic. Normally the rods are solid (see Table 2.9), but in 3% the rod is perforated lengthwise as in *60 Ash 1893 1-41 (406), and it seems probable that many of these rods were intended for use as beads. (Although in some cases the perforation is of such small diameter that this suggestion does not fully explain every instance.) In addition, there are examples of hollow rods, such as *63 UC 22889A, which appear to have been made over a white silica-like 'core'. These rods are

remarkably like faience in structure, but the 'glaze' is thick enough not to require the core to act as a carrier. As the glaze on faience is, itself, glass, whether these rods are classified as 'faience' or 'glass' is a matter of some subjectivity. Closer analysis of the internal structure of these 'rods', in particular the examination of the boundary layer between the core and the glaze/glass by Scanning Electron Microscopy might resolve the technique used to form these pieces. (See Kaczmarczyk and Hedges 1983 Chapter 4 for a review of the methods employed in faience manufacture.)

Many of the rods, nearly half the total, have some surface marks, most frequently shallow parallel lengthwise striations, or less commonly grooves. There are also a very small number of examples with spiral striations running round the rod (eg *62 UC 22755). It seems possible that the striations are unintentional marks acquired during the manufacture and manipulation of the rods, perhaps acquired during the rolling of the rods on a rough surface. The grooves, however, seem less likely to be accidentally produced for they are often quite deep, and in several cases there is only one lengthwise groove. In these examples it is possible that they were being prepared for inlaying a different coloured rod in order to create a striped rod, examples of which are represented in the manufacturing debris, in a process identical to the forming of rope moulded and

striped bands described below (Chapter 4). An alternative, and rare, method of producing a striped rod is represented by *105 UC 22912b where a sheath of white glass has been wrapped around a turquoise rod leaving a space where there is a turquoise stripe. Finally, there are two examples of mosaic glass composition rods (*111 UC 22934 and *12 UC 22934).

VIII Canes

Table 2.10 Canes Colour

Colour	B	T	W	Y	BK	R	C	BN	P	G	M	Total
No.	261	165	5	6	13	44	14	13	13	24	12	570
%	46	29	1	1	2	8	2	2	2	4	2	100

Canes are flat rectangular section strips of glass as illustrated by *130 UC 22924 on Fig. A12. (A selection of cane fragments is illustrated in Plate 3.) There are rare examples of other shapes of section in the canes; slightly concave (*124 UC 22924), square (*114 UC 22910b) and trapezoid (*132 UC 22916b). Very few of the canes have been altered from their strip form, although there are examples of bending (eg. *127 UC 22912b) and a few have shallow curves. Where the end has not simply been broken off, the canes often have rounded ends. Although, as in the case of *115 UC 22924, these rounded ends are often formed by the application

Table 2.11 Canes Characteristics

	Plain	Striations	Grooved	Depress.	Perf.	Tot.
Number	277	264	22	22	33	570
%	49	46	4	4	6	100

of pincers, as the chipped edge of *116 UC 22924 shows this was not the only method employed. Table 2.10 shows that again all the colours of glass are represented, with dark blue the most frequent colour. As with the rods, the canes frequently have marks on their surface (see Table 2.11), with parallel lengthwise striations again the most common form. In addition to, or separate from the striations, lengthwise grooves, or a rectangular section central depression are each found on 4% of the canes. In a few examples (eg *123 UC 22924), there are striations which run at an angle to the lengthwise axis. There are also cases of diagonal grooves on some of the canes, and these are probably linked to the manufacture of beads, by providing a weak point at which to snap the cane. Finally, 6% of the canes are perforated lengthwise.

The above is a summary of the main features of the Amarna glass working debris, the following chapters will attempt to interpret this evidence with respect to the manufacture of core glass vessels.

The Production Of Glass

The production of glass requires the input of various raw materials and the use of controlled pyrotechnology. The following chapter seeks to give an account of how glass was manufactured at Amarna (and throughout the Eastern Mediterranean) in the Late Bronze Age. Various forms of evidence, archaeological, archaeometric, textual and ethnographic, will be used to assess the potential methods used to manufacture glass.

The artefactual evidence representing debris from glass production and working at Amarna has been described above. A similar range of material has been recovered from the glass production centres of Malqatta (Keller 1983, Lilyquist pers. comm.) and el-Lisht (Keller 1983, Hill pers. comm.) in Egypt and Nuzi (Vandiver 1982b, 1983) in Northern Mesopotamia. Unfortunately, none of these sites has produced coherent evidence of manufacturing structures, such as kilns, associated with glass production, or clearly defined 'industrial' areas. At Amarna, both Petrie (TEA 22) and Woolley (Woolley 1922, 64), identified a specific area associated with glass production, and while their evidence is very sketchy, it seems probable that they recovered structures associated with glass manufacture. Petrie's (TEA 26) equivocal description of kilns and the quantity and range of glass production debris, mean that the site of Amarna has tended to dominate discussion of

glass production in the L.B.A.. Recent work on the vitreous materials from Nuzi (Vandiver 1982b, 1983), and Beth Shan (Mc Govern 1987, 1989) however, has greatly broadened our knowledge of glass production, while confirming the widespread use of similar techniques in different areas.

Archaeometric Analysis

Archaeometric analysis of the composition of ancient glass has a long history, and has provided many of the major contributions to our understanding of glass production. A number of methods have been utilised in the analysis of glass compositions from the purely qualitative analyses of Humphrey Davy (Turner 1954, 163), to more modern quantitative analyses based on techniques such as X-ray Fluorescence, X-ray Diffraction and Scanning Electron Microscopy (see Henderson 1990, 31-33 for review). The degree of precision attained by these methods means that it is possible to make generalized comments on the composition of the glass, particularly on the use of colourants. As more samples are examined, techniques refined and different questions addressed it is the scientific analysis of glass that will most likely shape our understanding of glass technology.

Textual Evidence

There is no unequivocal textual evidence from Egypt which may be related to glass production (see Glas. 6-10 for a discussion of potential Egyptian terms for glass). At the library of Assurbanipal in Nineveh, however, a series of texts were found which their translator, Oppenheim (Oppenheim et al 1970), has interpreted as instructions for the production of glass. Although the texts are from a mid 8th century context, based on philological and stylistic features, Oppenheim (ibid 80) dates the texts to the mid 2nd millennium. In a collaborative project, Brill attempted to manufacture glass by combining the materials described in the texts, and achieved results which suggested that the materials referred to in the texts are "almost certainly glasses" (ibid 107). That the texts refer specifically to the manufacture of glass has been disputed (Moorey 1985, 213), but it is generally accepted that the texts do refer to a vitreous material. As such they provide a valuable insight into the possible materials and methods employed in glass production, given the interaction of various vitreous industries. Finally, while they may post-date the L.B.A., contemporary 8th century B.C. glass production was essentially unchanged from earlier methods. Thus, while the texts, for several reasons, do not provide a certain interpretation of glass production, they are useful in indicating and supporting

possible manufacturing methods.

Ethnographic Evidence

Ethnographic studies have proved to be a valuable source for the study of faience technology (Wulff 1966, 166-7), but have had little influence on studies of glass technology. However, given the conservative nature of glass production, and the fact that a major change in composition did not occur until the end of the 1st millennium A.D. (Frank 1982, 74), it is possible that historical examples of glassworking may provide clues to ancient technology. This evidence is particularly important when considering certain aspects of the industry, notably the pyrotechnology involved. Of course, such evidence only serves as an indicator of potential methods, and must be combined with the other evidence to provide an understanding of glass production.

The Physio-Chemical Characteristics Of Glass

Glass is a super cooled liquid, formed by fusing a glass former with a modifier and a stabilizer by raising the raw materials to their melting point. Glasses of the New Kingdom are soda-lime-silicate glasses, with the glass composed of c60% silica, c30% soda and c10% lime (Turner 1954, 440-1). In addition a wide range of

metals were added to act as colourants.

Petrie (TEA 26) suggested that the Egyptians used crushed quartz pebbles to obtain silica free from iron for glass production. Such pebbles were recovered from the floor of a furnace at Amarna. Petrie (ibid) suggested that they had been heated in the furnace in order to ease their grinding. In his interpretation Petrie was influenced by the fact that quartz pebbles were used to supply later glass industries, for instance their use is recorded in post-medieval European texts (Frank 1982, 73). However, there are also examples of granite (a stone totally unsuited to vitreous production) with glass adhering, e.g. *149 UC 36470A, which were presumably also from furnace floors. This would tend to suggest that the incorporation of the quartz pebbles in the furnaces was unconnected to their potential as sources of silica. Alternatively, it could be that these pieces represent the deliberate glazing of stone, a practice with a long tradition in Egypt. Perhaps these partially glazed stones represent 'trial pieces' to assess the adherence of the glaze to the stone. Certainly, one quartz pebble, *150 UC 36471, which has frit adhering to its surface seems to be within the Egyptian faience working tradition, where the glazing of small objects by firing them in a powdered glaze (termed cementation) is well attested (Wulff 1966, Kaczmarczyk & Hedges 1983, 6). Moreover, quartz was not readily available at Amarna and as Lucas (Lucas 1948, 214)

indicated, sand would have provided both a more easily obtained and adequate source of silica. The use of sand as a source of silica is indicated by Kaczmarczyk and Hedges (Kaczmarczyk & Hedges 1983, 135) who note that the high magnesium levels in the glass and faience probably corresponds with its occurrence as an impurity in the sand. Moreover, in faience production, where very clean, white silica was occasionally used, it seems likely that sand was used after it had been washed and sorted (ibid 123). It is fairly common for this fine silica to be represented on the 'primary' material in an unfused or partially fused layer, for instance on *29a Ash 1893 1-41 (403). One piece, however, *36a Ash 1893 1-41 (403), with a large unfused grain of silica, indicates the possibility that quartz may have been incorporated into the initial batch. In general, though, it seems reasonable to conclude that sand was used to provide the vast majority of the silica for glass production.

As pure silica has a very high melting point (1710 °C) it is necessary to add an alkali modifier to reduce the melting temperature. In Egyptian glass it seems that the soda used as a modifier was provided by natron, which has a long tradition of exploitation as a gum/resin for instance in mummification. It is also possible to use plant ash as a modifier, and it may be that the potash levels indicate that plants were exploited as an additional alkali source (Frank 1982,

74). Certainly in the Mesopotamian texts, plant ash is mentioned as a constituent of the 'glass', with mention of the "naga" plant (Oppenheim et al 1970, 110), which is, unfortunately, unidentified. The plant *salicornia* has been suggested as the possible source of the alkali used in ancient glass and was exploited by later glass workers. The importance of plant ash to the Egyptian glass industry was, however, minimal (Kaczmarczyk & Hedges 1983, 22). Given that natron may have been employed as a binding agent in other vitreous technologies, faience for instance (ibid A10), it seems probable that natron primarily was used to provide the bulk of the soda for glass production.

The formation of a glass from silica and soda creates an inherently unstable and soluble glass, and it is desirable to add a stabilizer in the form of lime. It has been suggested (ibid, Tite et al 1987, 40) that calcium was present as a natural component of the sand exploited in glass production, with Turner (Turner 1956c 177) indicating that the sand near Amarna may contain high levels of lime as a result of the erosion of a nearby limestone bluff. (It is perhaps significant that this limestone cliff was used as a source of lime for modern Egyptian glass workers (ibid).) The translation of the glass texts, and their replication by Brill (Oppenheim et al 1970, 109), do not require that lime was added as a separate ingredient. Alternatively, the presence of consistent and relatively high levels of

lime in the Amarna glass may indicate the possibility that lime was added as a separate ingredient. Furthermore, lime was exploited in a number of different ways by glass workers; as a slip layer for crucibles (Turner 1954, 440), a coating for the cores on which vessels were formed (Bimson & Werner 1967, 266) and in bead production (Vandiver 1983, 77). The use of this slip layer is visible on several of the crucible fragments, for example *148 UC 36457, and on a few of the vessel fragments, for instance AF13. It seems reasonable to suggest then, that lime may have been added as a separate ingredient in glass production.

Colourants Used In Glass

In addition to these bulk components, the ancient glass makers also required access to metals to achieve the colours desired. Most glass analyses to date have centred on the identification, by physio-chemical means, of these colourants and their relation to the colours produced. The colouring of glass is a complex process, and depends on several factors: the initial batch composition in terms of the relative proportion of the colourant, the oxidisation state of the metal used as a colourant, the firing conditions of the kiln, and the rate of cooling (Kaczmarczyk & Hedges 1983, 258-9). This means, for example, that one metal, copper for instance, may be used to provide a range of colours.

While the degree of control over colour production practised by the Egyptians is uncertain, analysis has shown a relatively consistent pattern in the choice of colourants. The main colourants which typically gave the colours found in Egyptian glass are listed in Table 3.1.

Most of these metals were employed in the bronze industry, with copper and lead being two of the principal components of L.B.A. metal technology. At Amarna, it has been suggested that scrap bronze of recent vintage was used to provide the copper based colourants (Kaczmarczyk & Hedges 1983, 258-9), showing the interaction of the metal and glass working industries. Equally, the use of cobalt as a pigment has been widely noted in the painted pottery (*ibid* 204), and in other vitreous materials such as faience (*ibid* 41). These interconnections with other industries, and the implications of this for our understanding of the organisation of the glass industry are discussed more fully below (see Chapter 5).

Finally, in considering glass production, and particularly with respect to the use of colourants, it must be noted that our modern understanding of the chemistry of glasses was not shared by the Egyptian glass workers. This is evident in the variation in the colour of the glass. although they may be grouped into 'typical' colours ('turquoise' for instance), within each colour there are a number of marginal variations in shade, probably as a result of the lack of precise

Table 3.1 Colourants Used In Egyptian Glass

Colour	Probable Colourant
Blue	Copper Oxide <u>or</u> Cobalt Oxide [7]
Black	Reduced Iron
Brown	Iron <u>or</u> Metallic Copper
Green	Copper Oxide <u>or</u> Lead Antimonate [8]
Purple	Manganese <u>or</u> Cobalt Oxide <u>or</u> Nickel
Red	Metallic Copper
White	Calcium Antimonate
Yellow	Lead Antimonate

control. Such pieces as *7 Ash 1893 1-41 (403), a blob in which the clear glass has a yellowish tint, stand as examples of this lack of control of colour generation. While it is an exaggeration to suggest that the colours were produced by trial and error, it seems reasonable to suggest that the Egyptians were unaware of which element specifically caused the resulting colour. Thus the glass contains many ingredients which were either unnecessary (in modern terms) to achieve the colours, while other elements which affect the colour, such as manganese,

[7] Cobalt is used for about 1 in 3 of the faience glaze examples from Amarna, (Kaczmarczyk & Hedges 1983, 151).

[8] While lead antimonate seems to be preferred at Amarna during the Ramesside period copper oxide was more widely used. (ibid 148)

could have been included accidentally. This apparent lack of control is well attested in later glass working, notably in the 'use' of gold in red glass (Frank 1982, 82), and seems to indicate the continuation of traditional practice, including materials that were prescribed by practice, rather than technologically necessary. Certainly the composition of the Amarna glasses are sufficiently coherent to indicate the preparation of specific colours by a standardised process. That ancient glass makers were aware of some, if not all, of the properties of the colourants is indicated by the Mesopotamian texts (Oppenheim et al 1970, 119) where the colourant, in this case copper oxide, is added deliberately. As copper oxide would need to be prepared in advance by reduction in a furnace, it seems that at least an elementary understanding of the function of metal oxides was appreciated by the Egyptian glass workers.

The Amarna Evidence

In order to combine these raw materials to form a glass it is necessary to raise them to a temperature at which the materials will melt and fuse together. With soda-glass this occurs in the temperature range 800-1050 °C. In addition, it is necessary to reduce the glass through the temperature at which the silica would crystallise quickly to maintain the vitreous structure of

the glass. Thus the manufacture of glass is dependent on controlled pyrotechnology.

There are two possible ways in which glass could have been produced; the fusing of raw materials (the 'batch') directly to form a glass, or the prior fritting of the batch to partially fuse the material before vitrification. The available evidence suggests that it is the second of these methods, fritting followed by fusing, which was employed, despite the fact, as proved by Turner (Turner 1954, 443), that the materials could be fused directly within the range of available Egyptian pyrotechnology. Petrie (TEA 26) recovered fritting pans from Amarna which contained partially fused glass, (examples of these pans catalogued here are *146 UC 24690, *147 UC 25211B, *148 UC 36457 and *151 UC 36471). The process of fritting was also employed to produce Egyptian Blue (Tite et al 1987).

One area of debate is whether colourants were added at this stage. Certainly, of the material which may be classified as 'frit' in the debris from Amarna all is coloured, but as the range of colours is very restricted they may represent the preparation of materials other than glass. Petrie (TEA 26) suggested that clear glass was first manufactured and then subsequently coloured, and this also seems to be the case in the Mesopotamian texts (Oppenheim et al 1970, 119), where a base glass is formed then colourants added. Clear glass was produced at Amarna, but represents only a small quantity

of the material, there are only 4 examples of fragments of clear blocks for instance. Moreover, clear glass was employed at Amarna both in the manufacture of glass vessels (AF132), and was also reworked into rods and canes. This reworking would suggest that clear glass was produced for its own sake rather than as a stage in the preparation of coloured glass. Furthermore, the semi-fused material, such as *29 UC 22909a, where dark blue glass is mixed with poorly vitrified material, suggests that the colourants must have been added prior to the fusion of the glass. Taken in conjunction with the evidence that the fritting pans contained coloured materials it seems probable that the glass was formed from a batch which included colourants. While the glass produced tended to have a homogeneous structure, certain pieces (eg. *23 UC 22909a) incorporate semi-fused material. This may indicate the lack of sufficient control over the materials and the pyrotechnology involved. Alternatively, it may be that the existence of glass with silica still present suggests that the glass was fused directly from the batch. It seems more reasonable to accept the former suggestion in light of the other evidence supporting a fritting stage.

Finally, it is a common practice in glass production to add waste glass ('cullett') to the initial batch, both as a way of conserving raw materials and also because it assists in fusing the new glass. There is evidence for the use of cullett from Assur in

Mesopotamia (Moorey 1985, 20) dating to the late 13th century B.C. At Amarna, however, there is no unequivocal evidence for its use, although it seems probable that some, at least, of the glass debris may have been intended to be utilised in this fashion. Many of the pieces are too small to have had any other practical value. Furthermore, the inclusion of material as cullett is testified by such pieces as *58 UC 22921, a flake with both translucent dark blue and red glass. Equally, the presence of small volumes of different colour within some of the 'primary' material also suggests that cullett was used in the production of glass.

In his replication of glass manufacture, Brill (Oppenheim et al 1970, 112) employed a fritting temperature of 900 °C. While Egyptian Blue (which is formed by fritting) seems to have been produced at temperatures below 750 °C (Kaczmarczyk & Hedges 1983, 127). This gives a reasonable indication of the fritting temperature range for the glass. Subsequent fusion of the glass occurs in the temperature range 850-1050 °C. These temperatures were well within the range of contemporary pyrotechnology, as proven by the temperatures attained in the Timna copper smelters (Tite et al 1982, 70) for example. The need for temperature control, coupled with relatively high temperatures suggests the use of kilns in the production of glass. Moorey (Moorey 1985, 213), seems to misinterpret the evidence from Amarna suggesting that "an open hearth

system" was used, but Petrie specifically mentions "furnaces" (TEA 26). Despite the poor nature of the evidence, Petrie (ibid) suggested that glass kilns may have had a structure similar to a furnace in which he recovered charcoal. These furnaces were irregular square plan structures (ibid). In a later description, Petrie (Petrie 1910, 117) suggests that the kilns were circular in plan, with the floor lined with quartz pebbles and the crucibles containing the glass supported on inverted pots. A similar type of kiln has been identified at the New Kingdom glass production centre of el-Lisht (Kaczmarczyk & Hedges 1983, A30). Certainly, kilns must have been employed in the production of faience and so it seems probable that they were also used in glass production.

The Mesopotamian texts (Oppenheim et al 1970, 69-70) specifically mention three types of kiln employed in glass production. The 'kuru' kiln has four openings and was used for fritting and sintering material. A second type of 'kuru' kiln had the addition of a chamber and a door, and was used for melting the glass. Finally, there is the 'atanu' kiln which was employed for lengthy firings. Unfortunately no structures have been recorded at Amarna, or elsewhere, which correspond to these descriptions. The use of kilns in glass production, however, seems to be almost a certainty given the available technology and the technological achievements of the Amarna glass workers.

Aside from the crucibles, there is no artefactual evidence of the tools and containers associated with glass production. The crucible fragments were studied by Turner (Turner 1954), and it is worth restating some of his findings. There were two main forms of crucible employed, shallow saucer shaped crucibles used for fritting, as described by Petrie (TEA 26), and cylindrical crucibles which formed the basis of Turner's study. In addition, Petrie (ibid) inferred the use of shallow crucibles with a diameter of 7.5 cm from the impressions on blocks of glass. Of the debris that the author has seen, only one piece, *39 UC 22909a, appears to retain the impression of the crucible, and would appear to have a very small diameter c3 cm. It is possible that this, and the fragments described by Petrie may represent the melting of small quantities of glass, post production, rather than representing waste from a production stage. The cylindrical crucibles described by Turner (Turner 1954, 437) have a diameter of 17.5 cm and a depth of 12.5 cm, and seem to have been wheel produced in a standardised size and form. The crucibles, composed of refractory clay, were capable of withstanding temperatures of up to 1100 °C and thus probably represent those used for fusing the glass.

One feature of the crucibles is the presence of a slip layer composed of lime on the interior of the vessels (ibid 440). The presence of subsidiary layers on the 'primary' material, described above, would seem

to represent the fusion of this separation layer to the glass. As lime is only wetted by glass at temperatures above 800 °C (Vandiver 1982b, 81), this provides a minimum temperature at which the crucibles were employed. The presence of most of the subsidiary layers on the glass may be accounted for by this observation. Some pieces of glass have these layers on their horizontal surfaces (such as *57a UC 22919a), and these and the blocks with distinct layers (eg. *22 UC 22909a) may support Petrie's (TEA 26) suggestion that during the fusion of the glass, layers of impurities were formed at the top and the bottom of the crucible. Such pieces are, however rare, and it could be that they represent 'wasters' from which the available glass was recovered by chipping off the layers. Finally, in discussing the crucibles it is worth mentioning their capacity. The cylindrical crucibles have a volume of c3 litres, and would have provided sufficient quantities of glass for the objects produced in subsequent glass working. It is also interesting to note that, according to Brill (Oppenheim et al 1970, 127), the Mesopotamian glass industry was based on the production of glass in two distinct quantities, 3.5 litres and 800 cc. Given the capacity of the Amarna crucibles it appears that glass production there may have been based on the production of similar volumes. Whether this shows any connection between the two areas' methods of production is uncertain, but it may represent common practice based on

a shared tradition.

After cooling, the glass was chipped free from the crucibles prior to reworking. There are several features of the debris which support this; the presence of so many flakes and chips of glass, the presence of conchoidal fractures on much of the 'primary' material (as shown on the illustration of *49 Ash 1893 1-41 (403) (Fig. A12)) and the presence of parallel scrape marks on certain of the pieces, eg. *24 UC 22910a. Undoubtedly, the glass was reheated, either to a molten or plastic state, with only relatively low temperatures required for this reworking (675-703 °C (Vandiver 1982b, 77)). Some of the glass was turned in to rods and canes for subsequent use, with the rods being rolled or stretched out and then flattened to form canes.

Mosaic Glass

The presence of mosaic glass with the manufacturing debris was noted in passing above (Chapter 2). In total, there are four potential fragments of mosaic composition debris, *37 UC 22939, a block, *111 UC 22934 and *112 UC 22934, rods, and *138 UC 22934, a cane fragment. There are several observations to be made concerning this material. Firstly, the fragments of mosaic glass from Amarna, (including the two vessel fragments AF140 and AF142) is composed of small chips of glass which have been fused together to give an appearance similar to

conglomerate stone. This makes it quite distinct from the mosaic glass tradition in Mesopotamia, where rods and canes are used to form geometric patterns in a method akin to the later tradition of millefiori glass (Oppenheim et al 1970, 206-7). Secondly, the mosaic glass 'debris', is unnecessary for later production stages of mosaic glass objects, (except as use as preformed decorative elements), and it seems more likely that the mosaic glass was intended for use as inlays, either for architecture or furniture. Therefore it would be incorrect to consider this material as manufacturing debris. Finally it is important to stress that all of the examples listed here are only attributed to Amarna in the Petrie Collection. Taken in conjunction with the lack of mosaic composition 'workshop debris' from the sites of Malqatta and el-Lisht (Keller 1983, Hill and Lilyquist pers. comm.) this material should be treated with some caution. This is not to deny the presence of mosaic glass, as is evident from the vessel fragments (the manufacture of which is discussed in the following chapter).

Conclusion

In conclusion, while the constituents of the glass are well known, there is little evidence for the actual process by which it was made. This means that although it is possible to suggest potential production methods,

a degree of uncertainty must be attached to the acceptance of any proposed method.

The Manufacture Of Core-Glass Vessels

The production of a glass vessel is a complex process with two main, distinct phases; the formation of the vessel body and the decoration of the vessel. These stages are discussed in detail below, but it is worth noting at the outset that at every important stage, heat was required for the shaping of the glass. As discussed above, the temperature range required was well within the available Egyptian pyrotechnology.

Core Formation

Given the a priori production of glass, the first stage of vessel production was the manufacture and shaping of the internal core on which the vessel body would be formed. It is generally accepted that the core would be made over a metal rod to facilitate the handling of the vessel during the manufacturing process. One fragment, attributed to Serabit el-Khadem (SKB23)[9] shows a circular depression on the inner surface of the base, probably indicating where a rod was pushed through the core in to the plastic glass of the vessel wall. One fragment from Amarna (AB46) has a similar depression

[9] Catalogue numbers for Serabit el-Khadem material correspond to Simpson 1988, with the addition of the prefix SK.

again illustrating the potential for the rod to disrupt the vessel wall.

The two main properties of the core are that it must be capable of being shaped, often into quite complex shapes and hence must have good cohesive properties. Secondly, it must have a greater coefficient of expansion than the glass (ie. when heated it expands at a greater rate) so that on cooling it will contract more rapidly and hence not crack the glass. Petrie (TEA 25-27) suggested that the cores were made of sand, and in much of the literature the term "sand core" is employed, although it is almost certain that sand was not used. In his attempts at replication Schuler (Schuler 1962, 33) used a ceramic core, but as Labino (Labino 1966, 125) observed, as the coefficient of expansion of pottery is less than that for glass, the contraction of the vessel wall on cooling would lead to the probable cracking of the vessel wall. Labino (*ibid*) states that he overcame this problem, but deliberately refused to state the composition of the core. Bimson and Werner (Bimson and Werner 1968, 265-6) and Brill (Brill 1968, 47-68) have, to date, published the only analysis of actual cores from the New Kingdom, and found a highly ferruginous clay with haematite inclusions. Unfortunately this evidence came from the analysis of very few samples, and it may be that there is wider variation in the composition of cores.

The material used in cores is known from the

remnant layers left adhering to the interior of the vessels, normally quite thin c1-2mm thick, and as such may not be fully representative of the composition of the cores. It is, however, possible to make inferences from the surviving evidence. It appears, on visual analysis, that in the majority of cases the core is a partially fused layer. This material occurs in several different colours; white, grey, red, reddish white, and tan being the most common with also various shades in between. (see Table 4.1) These colours are not related to the incidence of the background colour of the glass, so they are not the product either of discolouration during manufacture or as a result of leaching post deposition. If the premise that different colours are indicative of different compositions is accepted, then this variation would suggest that there were a number of differing materials used to make the cores. Certainly, there is evidence to suggest that a variety of materials^{were}_^ used. There are two pieces of particular interest, AF13 and AF30. Both have remnants of a thick grey fibrous core, with in the case of AF13, this material separated from the vessel wall by a white layer. It seems probable that these represent cores composed largely of plant material, straw possibly, bound together with the clay mentioned above. In most cases such material could easily be removed by scraping it out, post production, due to its friable nature. Thus many of the comments concerning cores must by necessity concern the outer

Table 4.1 Core Colour Relative To Background

NUMBER OF FRAGMENTS

CORE COLOUR [10]	BACKGROUND									TOTAL
	BK	B	BN	G	LB	P	T	W	Y	
BROWN		2					1	1		4
BROWNISH		3					1			4
CREAM		11			1		2			14
GREY	2	95	3		5	7	10			122
GREY.BROWN		1					1			2
GREY/WHITE		1					1			2
GREYISH		3	1				1			5
ORANGE		1								1
ORANGEY		1					1			2
PINKISH	1	11		1			3			16
RED	1	4			1	1	5			12
RED.BROWN		2								2
RED.GREY		1								1
RED/GREY		1			2		2			5
REDDISH		32		1	3	4	14	1	1	56
TAN		27	1		1	3	2	2		36
WHITE	10	216	4	1	20	20	47	4	4	326
WHITE/BLACK							1			1
WHITE/RED		3				1	1			5
YELLOW.GREY						1				1
YELLOW.RED		1								1
YELLOWISH		2								2

PERCENTAGES

CORE COLOUR	BACKGROUND									Y
	BK	B	BN	G	LB	P	T	W		
BROWN		0.5					1.1	12.5		
BROWNISH		0.7					1.1			
CREAM		2.6			3.0		2.2			
GREY	14.3	22.7	33.3		15.2	18.9	10.8			
GREY.BROWN		0.2					1.1			
GREY/WHITE		0.2					1.1			
GREYISH		0.7	11.1				1.1			
ORANGE		0.2								
ORANGEY		0.2					1.1			
PINKISH	7.1	2.6		33.3			3.2			
RED	7.1	1.0			3.0	2.7	5.4			
RED.BROWN		0.5								
RED.GREY		0.2								
RED/GREY		0.2			6.0		2.2			
REDDISH		7.7		33.3	9.0	10.8	15.0	12.5	20	
TAN		6.5	11.1		3.0	8.1	2.2	25.0		
WHITE	71.4	51.7	44.4	33.3	60.6	54.0	50.5	50.0	80	
WHITE/BLACK							1.1			
WHITE/RED		0.7				2.7	1.1			
YELLOW.GREY						2.7				
YELLOW/RED		0.2								
YELLOWISH		0.5								

layers of what were most likely to have been two part cores. Other materials were also incorporated into the cores, possibly accidentally, for example the inclusion of turquoise frit in the core of AB30, and in another example (AF278) there is a metallic inclusion, possibly a small copper fragment. Finally that the entire core could be composed of white material is shown by AF63. These few examples serve to illustrate the variety in the cores used at Amarna.

It is equally probable that often the thin white material which remains adhering to the interior was used to form a distinct separation layer between the main body of the core and the glass, often between materials which are quite distinct eg. AF77 where it separates a red fibrous core from the glass, AF568 where it separates a black core from the glass and AF13 where it separates a thick grey fibrous core from the glass. In every instance where there is a two part core the layer to which the glass adheres is a thin white layer identified as limewash by Bimson and Werner (Bimson &

[10] The following abbreviations are used in the table overleaf BK-black, B-dark blue, BN-brown, G-green, LB-light blue, P-purple, T-turquoise, W-white, Y-yellow. In addition the appendix "ISH" signifies a shade of white ie GREYISH= greyish white. ORANGEY is similarly orangey white. A full stop (.) signifies a contraction of "ISH" while a slash (/) signifies a two colour core.)



Werner 1968, 265-6). There are three possible explanations as to why such a layer may have been employed. It could be that where the core consists of fibrous or lumpy material, the finer layer was applied to provide a smooth surface on which to apply the glass. Alternatively it could be that the glass would adhere more readily to the silica layer than to the fibrous core, thus the core could be shaped in a more malleable material and yet still provide a surface which would accept the application of the glass. Finally it could be that the white layer was used to enhance the colour of the vessel but, as it is used for both translucent and opaque glasses this seems an unlikely suggestion. It could have, of course, been employed to fulfill all these properties. It is interesting to note that Vandiver (Kaczmarczyk & Hedges 1983, A14-5) has observed the use of a fine white silica layer between the body and glaze layers of faience of New Kingdom date, and this may be one technique that shows the potential linking of the faience and glass working traditions.

In summary, it appears that the manufacture of cores was a relatively simple procedure, with a variety of materials used in their composition.

The Application Of Glass To The Core

The major problem in our understanding of the manufacture of vessels concerns the application of the glass to the cores to form the bodies. Schuler (Schuler 1962, 32-35) suggested several different methods which could potentially have been employed. These may be summarised as:

Method 1: Rolling - a heated core is rolled over powdered glass in order to fuse it to the surface.

Method 2: Dipping - a heated core is dipped in molten glass, with the glass being gathered to form the body.

Method 3: Trailing - molten glass is gathered on to a metal punty and is then trailed on to the core.

(Fig. 4.1)

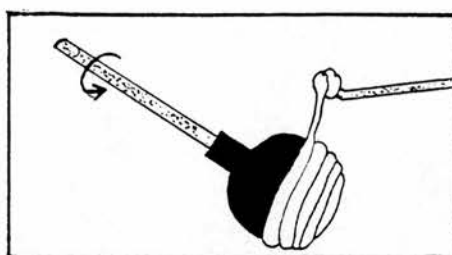
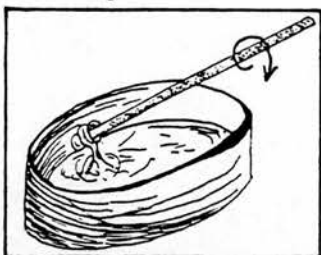
Method 4: Winding - preformed rods (and possibly canes) are heated and wound on to the core. (Fig. 4.1)

Method 5a: Coating with slurry - powdered glass is mixed with water (or some other liquid) to form a paste, or slurry. This is then painted or poured on to the core, and then the glass is fused in a kiln. (Fig. 4.1)

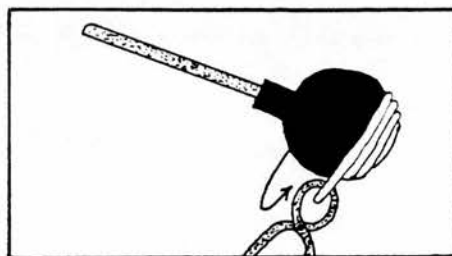
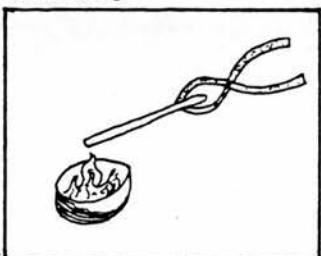
Method 5b: Coating with powdered glass - powdered glass is stuck to the core (presumably using some adhesive) with the body being fused in a kiln where the glue is burnt out. (Fig. 4.1)

Method 6a: Casting - an outer mould (either single or multi part) is manufactured over the inner core. The

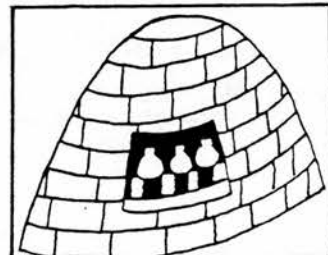
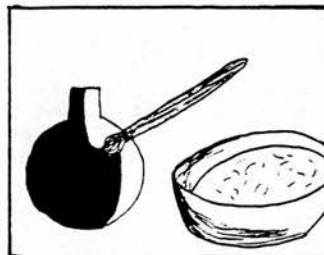
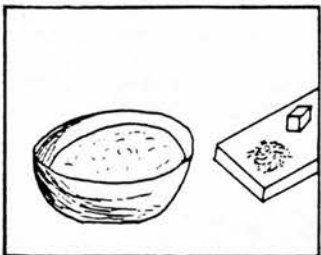
3 Trailing



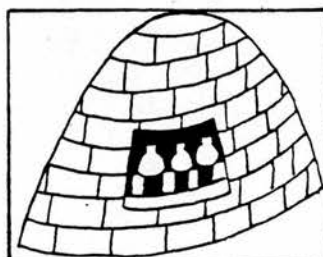
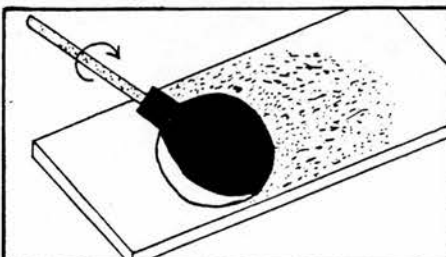
4 Winding



5a Coating With Slurry



5b Coating With Powder



6 Casting

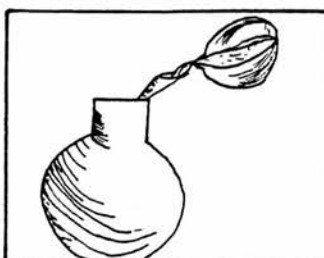
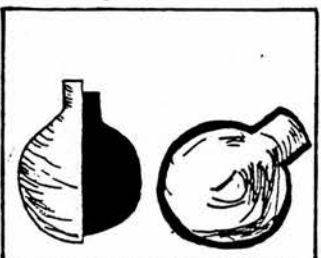


Figure 4:1 Methods Of Applying The Glass To Cores

glass is melted in a pouring crucible and then cast in the mould. The outer core is then removed. (Fig. 4.1)

Method 6b: Press moulding - glass is heated to a plastic state and then pressed over the core to form the body.

Unfortunately, because of the nature of glass, there are few 'wasters' as there are for instance in pottery production. If the vessel being produced was faulty in some way, the glass could be reworked. In the case of a complete failure the glass could be ground up and added as cullett in the preparation of 'raw' glass, a process that is testified by the inclusion of various colours in the crucible wastes and blocks produced.

There is only one piece attributed to Amarna which could reasonably be classed as a 'waster' (AF603), where the neck has been folded over and one edge has been rounded. Unfortunately, this piece does not really seem to be indicative of any of the suggested methods of production and, furthermore, its warped nature could be indicative of exposure to heat after it was discarded. Given that this piece was decorated, it would seem reasonable to accept the latter interpretation. If an unsuccessful attempt had been made to form the body, which the shape implies, it would have been unlikely that it would then be decorated. In the absence of any direct evidence as to the method of production from 'wasters', it is necessary to consider the other evidence of manufacturing techniques. This evidence takes three

forms; evidence from the finished vessels, an examination of known techniques of glass working (both ancient and modern) and an examination of the bubbles trapped within the vessel's matrix.

Method 1: Rolling And Method 2: Dipping

The first two of the methods, rolling and dipping, may be rejected on the grounds that they require a heated core. Given the composition of the actual cores it seems that their intended property was ease of removal rather than heat retention, and this argues against a heated core. In addition, dipping is unlikely to have been practiced for a further reason. In order for this method to have been used, a large quantity of glass would have to be raised to and maintained in a molten state. An objection to this proposal is that there is no evidence that the Egyptians were capable of melting such quantities, for instance all the crucibles recovered by Petrie (TEA 26) were relatively small, and there is no record of dipping troughs or other large containers of glass at Amarna.

Method 3: Trailing On

In most recent literature, the technique of trailing on (Method 3) has received widespread acceptance. In his replication of the core forming

process, Labino (Labino 1966) used this technique and produced vessels with features identical to ancient examples. Furthermore, the use of trailing on as a decorative technique is well attested, with a similar process (although using preformed rods) being used in the manufacture of beads on copper wire (TEA 27). This technique was, then, certainly within the technical range of the Egyptian glass workers, and it seems probable that it was used. However, this method could not have been uniformly employed to manufacture the bodies. For instance it is difficult to conceive of how such a method could be used to produce open shapes, especially such forms as shallow bowls and dishes. Secondly, there are certain vessel fragments with laminated or mosaic composition bodies and trailing on cannot adequately account for such vessels (see below). Finally, such a method would require only molten glass, to be gathered on to the punty, and there is an apparent difficulty in explaining the number of rod fragments at Amarna.

Method 4: Winding On

Method 4: winding on rods is similar in some ways to trailing on and has much to commend it as a plausible technique. In this method preformed rods and/or canes of glass are wound around the core. The rods being shaped either with tongs, or by dragging them with a punty.

this method would seem to offer an explanation for the high number of rod and cane fragments, many with trailed ends at Amarna. Moreover, as discussed below, rods were certainly wound on to the vessels, to form decoration, rims and bases, and thus there is evidence that this method was employed by the Amarna glass-workers. This method, however, cannot account for mosaic and laminated construction vessels.

Method 5a: Coating In Slurry

A similar technique to the coating of a core with a slurry containing glass (Method 5a) is known in faience production (termed 'application' (Kaczmarczyk & Hedges A14-15)). If this technique was employed, it could adequately explain both the self coloured and mosaic backgrounds represented by the fragments. There are problems, however, in accepting that this method was used. Firstly, there is the problem of the slurry adhering to an organic core, but this may not particularly relevant as the cores often seem to contain an intermediate layer which may overcome this problem. Unless the vessel body could be formed by a single application of slurry, it would be necessary to have distinct layers in the vessel, and this is not a uniform feature of the vessels, with most of the vessels, bodies having a homogeneous structure. The application of the glass in a slurry would also tend to lead to similar

features as those visible on faience vessels made by application. That is that the glass would tend to be thicker in the lower body, and this does not seem to be the case with the glass vessels. Such a method would require the use of a kiln, and while such kilns must have been available (as witnessed by faience production), the published evidence, while it does mention kilns (TEA 26) provides no detail as to whether they were suitable for fusing a slurry coated core. Finally, a theoretical objection has been raised by Labino (Labino 1966, 125) against methods which employ more than one technique for body formation and decoration. Such an objection is, however, unsustainable in the face of the evidence from Amarna which illustrates a wide range of techniques for working both glass and other vitreous materials. Again this method fails to account for the full range of glassworking debris, requiring only that glass be available in powdered form.

Method 5b: Coating In Powdered Glass

Both laminated and mosaic construction vessels are best accounted for by the process of coating the core with powdered glass and then fusing in a kiln (Method 5b). The most simple form of lamination is simply two layers of glass, as in AF615, which is similar to flashing, as exemplified by AF272, and both were

probably achieved by the same process. While such simple examples could potentially be explained by a number of techniques, there are fragments such as AF364 where there are five distinct layers in a 3mm thick fragment, such thin layers suggests the use of powdered glass. The mosaic glass fragments (AF126, AF140 and AF142) also support the use of powdered or chipped glass in the manufacture of bodies. Potentially there are three ways in which mosaic glass vessels could be formed; manufacturing a self coloured vessel then decorating it, the fusing of chips of powdered glass (in a process similar to the later millefiori technique) or the winding on of mosaic rod fragments. In the first method the inner surface of the vessels would be a uniform colour, but in the fragments the inner surfaces also have mosaic composition. While there are examples of mosaic glass rods and canes, they are very rare, with only two examples of the former (*111 UC 22934 and *112 UC 22934) and one of the latter (*138 UC 22934). Moreover, the composition of the vessels is consistent with the fusing of chips of glass. The use of this technique for mosaic glass vessels implies that, by extension, this method was probably used for the laminated pieces. It could also be used as a blanket explanation for the formation of bodies but, many of the vessel bodies show a homogeneous structure rather than a layered structure.

Method 6a: Casting On

Based on his attempts at replication (done using the wrong composition core) Schuler (Schuler 1962 36) proposed that the vessel bodies were cast in moulds over the cores. One advantage of this method is that there is no restriction on the range of shapes which can be produced. There is no evidence for the casting of objects in glass at this date, and while negative evidence must always be treated with caution, it is highly significant that Petrie (TEA 26) and later excavators, appear not to have found any mould fragments associated with glass working on the site. Furthermore, such moulds would have ^{been} by necessity constructed of two different materials (the coefficient of expansions of the outer and inner parts of the mould must be different) and there is no evidence, in the form of material adhering to the outer surface that such outer moulds existed. This method also fails to account for the numerous rod fragments. While it is impossible to rule out this method, it seems unlikely to have been employed in the forming of vessel bodies.

Method 6b: Press Moulding

There is considerable evidence for the technique of press moulding (Method 6b) being used in the manufacture of small faience objects, inlays, beads etc., at the

site of Amarna (Kaczmarczyk & Hedges 1983, A25-6). Similarly, certain small glass objects seem to have been moulded, for example the famous red glass Amarna princesses statue (for a description of the techniques involved in the manufacture of this piece see Samson 1972, 74). There is also an example of a small fish shaped spoon (Ash. 1989.85) (Whitehouse and Henderson pers. comm. and forthcoming) which seems to be press moulded. Although the fish is unprovenanced, and hence undated, the colour ('apple' green), form and workmanship are all suggestive of a New Kingdom date. This may support the application of the technique of press moulding in the formation of vessels. If such a method was used, however, it would primarily have been used for shallow and open shapes, which represent a minority of examples in the forms of the vessels.

The Manufacturing Evidence

The following methods may be considered as possible techniques for the production of vessel bodies; trailing on (Method 3), winding on (Method 4), coating in powdered glass (Method 5b) and press moulding (Method 6b). Of these methods, only that of coating with powdered glass and then fusing is reasonably indicated. Of the other methods, a major objection to those other than winding (Method 4), is the presence at Amarna of so many glass rods. In assessing the methods used it is

worth considering what role, if any, these rods had in the forming of the bodies.

The first observation to make is that while there is evidence that the rods (and to a lesser extent the canes) were used to form rim and foot bands, handles, decorative elements and in the manufacture of beads, there is no example where rods can be shown to have formed a vessel body. While negative evidence must be treated with caution, it seems strange that where such a wide range of debris is represented this should be the case. Another point is that while rods are numerically the most frequent form of manufacturing debris, many of the fragments are quite small, and this leads to an overestimation in their importance relative to the volume of glass debris represented.

The manufacturing debris was examined in terms of the volume represented by considering the various forms as regular solids; blocks as cuboids ($v=lwt$), flakes as wedges ($v=\frac{1}{2}lwt$), rods as cylinders ($v=\pi r^2 h$) and canes as cuboids ($v=lwt$). Such a method is, of course, inaccurate, but more accurate measurements were impractical [11]. A division was also made between

[11] Measuring the volume by displacement would have been the ideal estimation of the volumes, but this method is, not unreasonably, discouraged by museums. Alternatively weights may have given a more accurate measurement, but it could lead to errors due (over/)

"primary" debris, representing crucible products (blocks and flakes) and "secondary" debris which has been formed into other elements (rods and canes). The resulting volumes, expressed as a percentage are given in Table 4.2. In addition the colours of glass employed were classified as either "background" or "decorative" according to their incidence in the fragments. This data is presented in Table 4.3.

There were three relationships to be tested:-

Proposal 1: If the vessel bodies were formed without the use of rods or canes then "background " colours would show a higher proportion of "primary" rather than "secondary" debris.

Proposal 2 : If the rods and canes were used for decorative purposes only, then "decorative" colours should show a higher proportion of "secondary" rather than "primary" debris.

Proposal 3: If the rods and canes were used to form the bodies then "background" colours should have a higher proportion of "secondary" rather than "primary" debris.

[11] (contd.) to the mixed composition (ie. the presence of subsidiary layers alongside the glass).

Table 4.2 Percentage Of Each Form of Debris By Colour

Colour	Blocks	Flakes	Rods	Canes	Prim.	Second	Type
Black	31	37	27	5	68	32	Background
Brown	8	42	46	4	50	50	Background
Clear	8	50	39	3	58	42	Background
Dark Blue	24	34	30	12	58	42	Background
Purple	16	28	50	4	46	54	Background
Green	7	25	55	13	32	68	Decorative
Red	18	34	15	33	52	48	Decorative
Turquoise	17	23	38	22	40	60	Decorative
White	1	39	38	22	40	60	Decorative
Yellow	2	2	89	7	4	96	Decorative

Of the colours which are classed as "background", all the colours with the exception of purple show a greater concentration of material in the "primary" rather than the "secondary" class of debris. Even in the purple glass there is a 46/54 split in the material, ie. still a relatively high proportion of "primary" debris. This, then, would tend to support Proposition 1 above, that the bodies were formed from raw glass and that rods were not an essential component in the manufacture of vessels' bodies. The "decorative" colours with the exception of red, have a concentration of "secondary" rather than "primary" debris. Red glass is so infrequently used for vessels, even in the decoration, that it is a reasonable assumption that most of the red

Table 4.3 Percentage Incidence Of Use Of Colours

Colour	Background	Decorative
Black	2	1
Brown	2	0.6
Clear	0	0
Green	1	4
Dark Blue	65	7
Purple	6	0.4
Red	0	2
Turquoise	21	26
White	2	94
Yellow	1	69

glass was primarily intended for other uses, typically as inlays in composite articles. Furthermore, there is a very strong link between the use of yellow for decoration and a very high proportion of yellow glass represented as rods. Thus it would seem that rods were used as decoration rather than to form the bodies of the vessels. It would seem, then, that winding on of preformed rods (Method 4) was probably not employed to form the vessel bodies.

The Pattern Of The Bubbles

In an effort to resolve the method or methods used,

an examination was made of the patterns of the bubbles in the glass, in the hope that they would be indicative of the form of production. Very few pieces had bubbles on the exterior surface and this may be explained by the fact that they would typically be removed by marverring the surface of the vessel. There were more fragments with bubbles on the interior from where they could not be removed, but in general there were too few bubbles to form a consistent pattern and, where the core survives, it prevents the examination of the inner surface for bubbles. Moreover, where there are bubbles these need not be representative of the manufacturing process but may rather indicate irregularities in the surface of the core.

The pattern of bubbles in the matrix was felt to be potentially more indicative of the method of manufacture, but normally only a section through the matrix, along the broken edge is available and so no patterning can be determined. To resolve this, twelve fragments were X-rayed to pick up the bubbles (shown in the plates as dark spots) to see whether any patterning could be determined. Two factors were taken in to consideration when selecting the fragments. Firstly, at the request of the museum, fragments with cores remaining were excluded from the study. Secondly, the orientation of the fragment in the vessel had to be known, and for this reason there was an automatic preference for rim and base fragments. Finally, the most

probable vessel type to exhibit signs of casting would be open bowls, and so a selection of bowl fragments were deliberately represented in the sample. The fragments were chosen from the collections of Amarna and Serabit el-Khadem material held in the Ashmolean Museum.[12]

It was anticipated that certain patterns of bubbles might be associated with particular methods of production.

Method 3 - Trailing - A pattern of elongated bubbles, possibly with a spiral structure at the junction/overlap of the molten trails.

Method 4 - Winding - Elongated bubbles in the individual rods and a concentration of bubbles along the junction of the rods.

Method 5a - Coating with slurry - A random distribution of bubbles.

Method 5b - Coating with powdered glass - A random distribution of bubbles.

Method 6b - Press moulding - Few bubbles with a random distribution.

With respect to the resulting X-ray plates (see Plates 7-11 and Appendix B), all the fragments with the exception of SKR1 exhibited some bubbles. Nearly all the

[12] The author is grateful to the Conservation Dept. Staff of the Ashmolean Museum who undertook this work.

bubbles are circular with one exception on AR8 where a bubble has been elongated, following the rim edge. Although this need not be indicative, for in the decoration which is known to be trailed the bubbles are circular, so they may not have been distended as a result of the manufacturing techniques. In considering the size of the bubbles (see Table 4.4), it is worth noting that there tend to be more small and tiny "pin hole" bubbles than large bubbles (with large bubbles being classed as those with diameter $\geq 2\text{mm}$). It is perhaps significant that large bubbles are more common in bowls and bases and it is possible that in the case of the bowls this may indicate that they were made using a different technique from the closed shapes. It is also interesting to note that AB5 shows a distinct layering effect (this piece was visually identified as of laminated construction), and, given the argument above, it may be that large bubbles are associated with the fusing of powdered glass (Method 5b). The size of the bubbles, then, with large bubbles more associated with open forms, may indicate that different manufacturing techniques were employed for different forms.

With respect to the alignment of the bubbles (see Table 4.5), it seems that where the bubbles occur in strings they mainly occur on decorative trails. Significantly, of the four decorated fragments which have aligned bubbles, only one, AF3, has an alignment which does not follow either the decorative trails or

Table 4.4 Size Of Bubbles

Form	Total	Large ($\geq 2\text{mm}$)	Small ($< 2\text{mm}$)
Open	3	3	1
Closed	7	2	6
Bases	2	2	0
Body Frags.	4	1	4

Table 4.5 Alignment Of Bubbles Relative To Decoration

	Total	Aligned To Decor	Other Align	Random
Decorated	10	7	4	2
Undecorated	6	-	2	2

the edge of the rim. There are two undecorated pieces in which the bubbles are aligned, in one they follow the line of the rim edge and the other alignment seems to be a result of the laminated construction of AB5. There is no evidence for a spiral structure revealed in the patterning of the bubbles, but this may be a result of subsequent marverring and tooling (Labino 1966, 124) and so it cannot be used to deny the possibility of trailing as a manufacturing technique. It seems, then, that the patterning of the bubbles is primarily related to the decoration on a vessel. The variety in the distribution of the bubbles does not seem to be related

to the form of the vessel, as Table 4.6 shows. It is worth noting in passing, however, that a random structure seems to be confined to the bodies rather than to the decoration, and while highly speculative this may indicate that in these examples the body was not formed by trailing. While the patterning of bubbles seems mainly related to the presence of decoration, the variation, even within such a small sample, supports the suggestion that a number of different methods may have been used to form the vessel bodies.

Table 4.6 Alignment Of Bubbles Relative To Form

Form	Total	Aligned To Decor.	Other Align.	Random
Open	3	0	1	0
Closed	7	6	3	4
Bases	2	0	1	1
Other	4	1	1	2

It would appear, then, that the only method which can be inferred from the evidence with any certainty is the fusing of powdered glass (Method 5b), but it is unlikely that this method was uniformly employed. The X-rays seem to suggest that casting on (Method 6a) was not employed. Taken in conjunction with the absence of moulds and pouring crucibles, it seems highly unlikely that this method was used. The X-rays also show no evidence of a spiral structure to the vessels and this,

alongside the evidence that the rods were reserved primarily for decorative purposes would tend to exclude winding on (Method 4) as an explanation for core forming. This lack of evidence of a spiral structure may also be used to argue against trailing (Method 3) as a technique. Given the fact that this would be the only reason for rejecting this method, and that supporting evidence for this method would be ephemeral, it must still remain a possibility that this method was used. It must be stated that other methods, as yet unappreciated, may have also been used to form the bodies. Of those under consideration here, it seems likely that trailing on (Method 3), coating in powdered glass (Method 5b) and press moulding (Method 6b) may all have been employed in the forming of vessel bodies. Given the range of techniques available to the glass workers at Amarna, and their technical accomplishment, it seems reasonable to suggest that a number of different methods were used to core form the glass vessels.

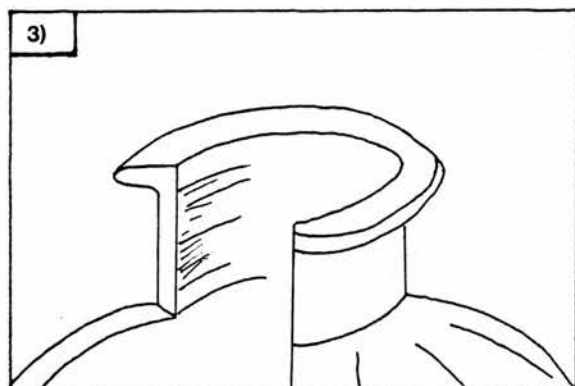
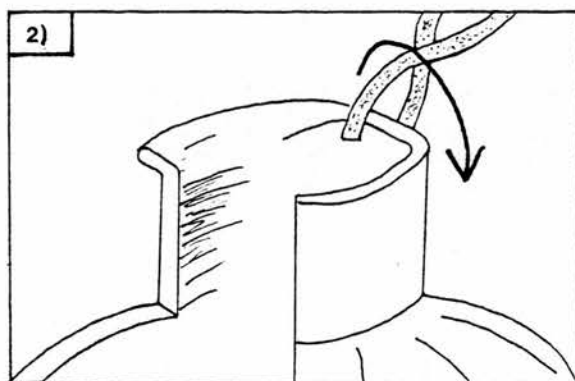
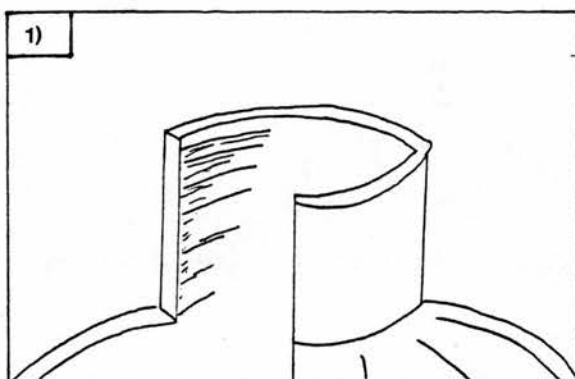
Rim And Base Formation

Having produced the basic body shape, it was necessary to form the rim and base. The most simple rim was formed by rounding or squaring off the rim edge as in AR101 and AR79. More commonly, in the Amarna material, the rim was formed by using pincers to tease out the top of the neck to form the rim edge and then

smoothing the resulting rim (see Fig 4.2). This process could either be carried out before the vessel was decorated eg. AR14 and AR4, or after the decoration was applied with the resulting distending of the trailed decoration, eg. AR21 and AR38. Another method for forming the rim was to take either a rod or prefabricated band consisting of two or more colours twisted together and winding it on (see Fig 4.2), an example of the former is AR30 and the latter AR20. In one case, AR35, a yellow band was applied to the edge of the neck before the addition of the rim band. Typically the edges of the band would then be smoothed to form a rounded rim edge. A separate layer of glass was occasionally applied as flashing around the mouth, eg. AR47, possibly to form a surface level with the upper edge of the rim but this is conjecture.

There are three main technological groups of bases used on Egyptian core-glass vessels; apodal and flat, footed and pedestal, and disc bases. Flat and apodal bases were formed as an integral part of the vessel when the glass is applied to the core. Footed and pedestal bases were formed by twisting out glass from the body of the vessel, or more probably by adding a blob of glass to the base of the vessel and twisting this out, eg. AB18 and SKB2, and then tooling the base to make it level. The resulting base has a hollow profile in the case of the high footed forms. In essence flat footed forms were made in the same way as rims that have been

Twisting Out



Winding On

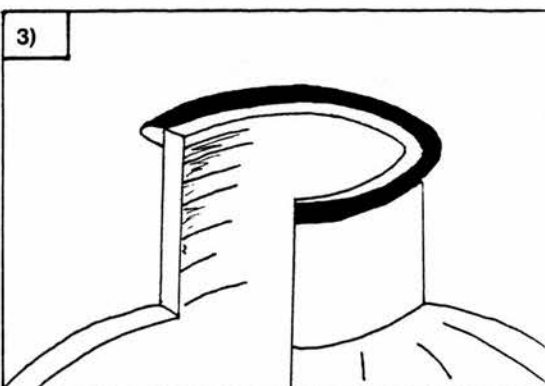
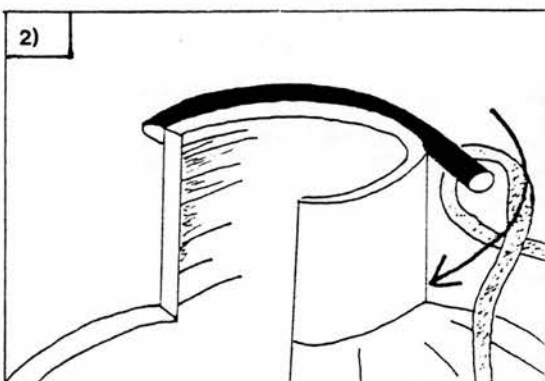
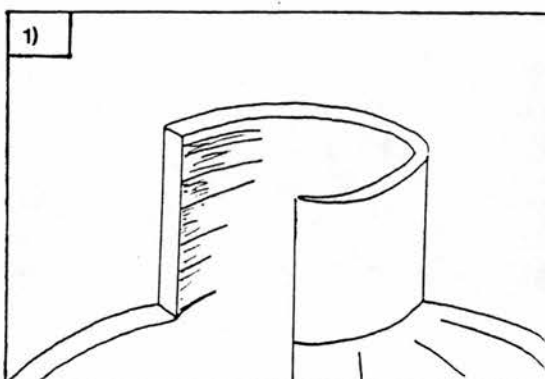


Figure 4:2 Formation Of Rims

teased out. Disc bases were formed in one of two ways. A small projecting 'stump' base was formed and this then had a separate band applied around this projection, in much the same way as rods were applied to form rims, examples of this technique are AB12 and AB13.

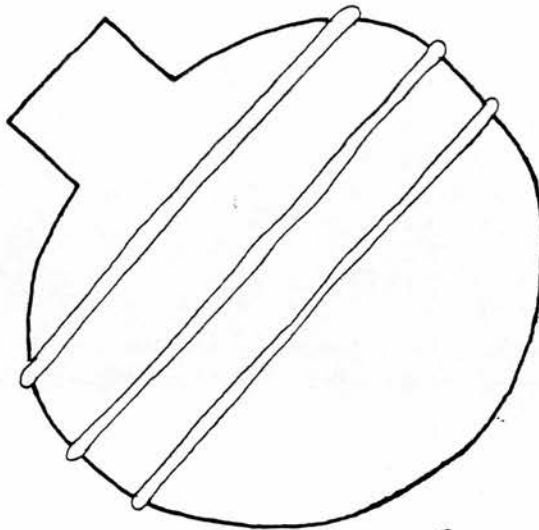
Alternatively, a separate disc base could be formed (in a way similar to disc inlays and decoration discussed below) and then separately added to the body.

Decorative Techniques

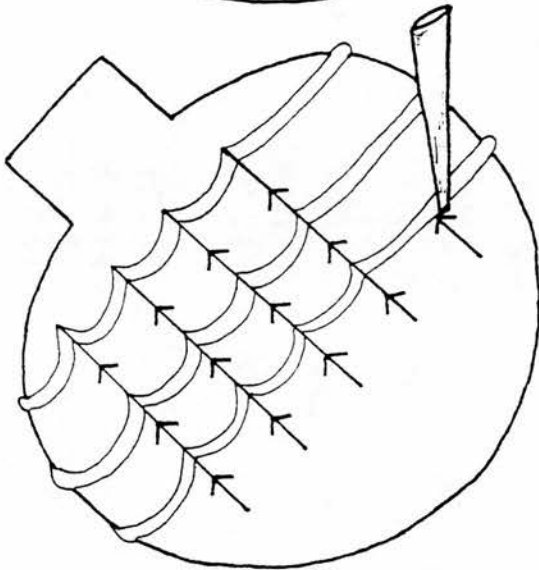
The most typical method of decoration involved the use of contrasting coloured glass either as trailed decoration or as prefabricated decorative elements. In creating trailed decoration a rod of glass was trailed in to the surface while molten, to form a band, normally these trails were quite shallow, but in one piece AF592 the trail has penetrated almost to the core. The decoration could then be either left as plain bands, or more commonly was dragged to create either the characteristic feather or festoon patterns. To create festoon decoration a sharp implement, probably a stylus type tool, was dragged vertically up the surface of the surface of the plastic glass to create a series of 'U' loops, while in feather decoration alternate upwards and downwards strokes were used to create a 'W' shaped form (see Fig 4.3). Occasionally, the vertical grooves where the dragging took place have been left visible even

after marverring. Sometimes the trail decoration was deliberately left standing proud of the surface, and some decoration may have been added after the surface had been marverred, eg. AF5 and AF126. In some cases too there are pin hole marks at the curved terminals of the decoration where the implement has been removed from the surface, eg. AF95.

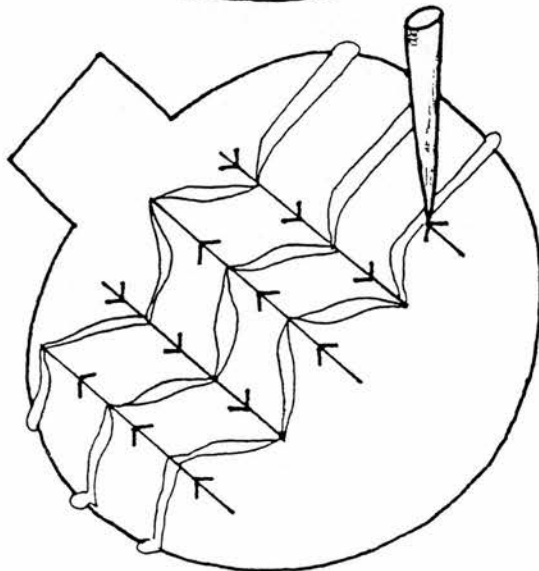
The edges of the trailed decoration were not always sharp, for example AF177, AF277 and AF545, and it is possible that this effect was deliberately achieved by dragging the vessel parallel to its vertical axis when marverring the surface, as normally the edges of the trails would not smudge. The inlaid rods need not be of a single colour, with multi coloured bands common. The creation of edged bands, as on AF376 and AF41, was probably achieved by using striped rod fragments, examples of which are common in the manufacturing debris. When the surface of one of these rods was flattened it would give the appearance of edging on the trails. There is also, however, evidence from one fragment, AF228, that the same effect could be achieved by winding on a different coloured rod in to a pre-existing band. Finally, while the initial bands normally meet at the ends, there are a few examples where this is not the case, AF1 for instance. Initially it was surmised that such pieces might represent unfinished vessels, however AF460 stands as a caution to this interpretation, for in this fragment a yellow trail



Rods Wound On To Form Bands



Bands Dragged Upwards To Form
Festoon Decoration



Bands Dragged Up And Down To
Form Feather Decoration

Figure 4:3 Formation Of Decorative Trails

is joined with white, and has also been trailed to form finished decoration.

A less common form of decoration using contrasting coloured glass was the use of prefabricated elements. The most simple of these was the use of twisted two coloured bands which were then wound on and marverred to form striped bands. In two vessels represented by AF59 and AF620, two striped bands have been laid parallel but with the stripes running in opposite directions to give a chevron effect. The other prefabricated element employed are multi-ringed disc inlays used to form the 'eye' and 'sun' decoration. A disc inlay, *139 Ash. 1925.417, probably intended for use in conjunction with another material, shows the most common way in which these discs were constructed. First the largest disc was made in one colour; it may be that these discs were initially chipped in to shape (eg. *143 UC 22924) and then had their edges rounded, alternatively they could have been fabricated from plastic glass either by tooling or possibly by press moulding. After the initial disc was formed, further complete discs with smaller diameters were inlaid to leave the surface with a series of concentric rings. In addition, one fragment, AF69, had a striped band added as an outer ring to form 'sun' decoration. One vessel represented by two fragments, AF144 and AF54, illustrates an alternative way of constructing eye decoration, a circular centre was manufactured and then a series of different colored rods

were wound round the centre to form the eye decoration.

Although decoration was normally executed with the addition of contrasting coloured glass, two methods were employed which did not, incision and panelling. Incised decoration seems to have been reserved mainly for the creation of cartouches, eg. AF50 and AF189. As the lines of incision are sharp it seems probable that the cartouche was incised with a sharp tool after the glass had cooled. If they had been carved while the glass was still plastic and viscous, the edges of the incision would be rounded. There are traces of white material in the resulting grooves and it is probable that they were filled to increase the contrast with the background. This material has a grainy texture and could either be unfused silica or glass which has been powdered and then mixed with an adhesive to fix it in the incision. One further piece shows that the use of incised decoration, AB6, where a base fragment has a series of vertical grooves extending on to the upper edge of the foot, but in this case the grooves are rounded in profile and so it seems probable that they were created while the surface was still plastic. Finally, on one fragment, AR31, the surface has been decorated by creating flat vertical panels, these were made by flattening the surface while plastic with a flat, spatula like tool. Two further fragments, AF587 and AF190, may also represent attempts at this technique, although this is in no way certain.

After the vessel had been decorated and marverred (that is rolled on a flat surface to smooth the surface of the vessel), handles could be added to finish the vessel.

Handles

Handles were most usually formed from rods, often undecorated, but occasionally, canes, often decorated were used to form handles. There are three forms of handle; strap, neck to shoulder and loop handles, and all are formed by fusing preformed elements to the vessel body. In the case of strap handles a cane, either plain or decorated with contrasting trails, was heated until plastic. One end was then fused to the shoulder of the vessel and the cane was trailed upwards, with the other end being fused to the neck. Circular section rod fragments were used to form neck to shoulder handles by exactly the same process. Loop handles are invariably formed from rods, with a similar process to the formation of other handles. Instead of trailing the rod upwards, the rod is brought round in a curve so that both ends are fused level on the vessel's shoulder.

Annealing And Finishing

In shaping and decorating the vessel it is apparent that a number of different techniques were employed.

These different techniques, however, are all linked by the application of heat to the vessel during their execution. Indeed, most glass working is done by the direct application of heat to raise the glass to a plastic state. Thus, while some techniques employed are similar to other industries, especially the faience industry, glass working is distinct from other 'ceramic' industries in being worked in a heated state. In short, glass is a 'hot' technology, akin to the traditions of metalworking, rather than a 'cold' one, in which the major stages of manufacture are executed and heat is applied as a distinct and separate stage, as in faience and pottery production.

Furthermore, this working under heat meant that when the vessel was effectively finished, it had then to be annealed to prevent the cracking of the vessel on cooling because of thermal stresses in the glass and to bring the glass through the temperature at which a regular crystalline structure would form while maintaining the vitreous nature of the glass.

Once the vessel had cooled, all that remained was to remove the core, and the marks of the narrow bladed tool used to remove the cores can be seen on AF620 and AF628. As one might expect, this was a process carried out in no regular fashion with one having vertical and the other horizontal marks. Normally a thin layer of core was left in place, but one fragment AF629 where the core has been completely removed has a very irregular

inner surface showing the result, possibly of over gouging out of the core.

The Organisation Of The Glass Vessel Industry

It is a common assumption that glass production, and certain aspects of glass working, including the manufacture of core glass vessels was restricted to a few workshops (eg. Glas. 22-6 and Kaczmarczyk & Hedges 1983, 223). Given the nature of glass as a luxury product, requiring a wide range of exotic raw materials, it seems reasonable to suggest, that production was largely dependent on the state, via either the institutions of the temple or palace. The evidence from Amarna concerning the social aspect of the organisation of the glass industry is quite poor, and much rests on interpretations which are highly speculative. Taken in its entirety, however, the evidence from Amarna suggests that glass production, and probably the manufacture of vessels, was essentially a royal monopoly. There is also evidence for the widespread manipulation of glass, largely in the manufacture of beads, and the possibility exists that vessels may have been produced outwith royal control.

The Nature Of The Evidence

There are problems associated with using the evidence from Amarna to discuss the organisation of the glass industry. While the low esteem in which the "Heretic" (Ahkenaten) was subsequently held means that

much material, particularly objects intimately associated with his reign, was deliberately left behind. The assemblage is undoubtedly incomplete for many artefacts, particularly portable and luxury items, would have been removed by the general population on the abandonment of the city. As it is largely debris from production on which any understanding must be based, this should not unduly bias the evidence for recognising glass "^{workshops}~~workshops~~", as such material would not have been removed on abandonment.

More important is the level of recording in the primary source of information on the site, the COA volumes. Table 5:1 shows the incidence of the recording of glass debris in these reports. Given the quantity of material held in museums, it is obvious that there is a gross under representation of the glass recovered, particularly with respect to COA I. This incomplete record is not unique to the glass debris but affects many of the finds from the site. For example, Kemp has noted the incomplete recording of the pottery (Kemp 1981, 17). The extent to which the evidence is biased is represented for example by Newton's statement; "In almost every house...we found...fragments of glass rods for the manufacture of glass vessels." (Newton 1924, 303). This observation that rods are scattered over the whole site, has been confirmed by Boyce (pers. comm.). Such a distribution is certainly not reflected in the published reports.

Table 5:1 Reported Instances Of Glass Debris

Volume.	Primary Debris [13]	Secondary Debris	Both
COA I	1	1	0
COA II	4	4	2
COA III	4	31	1
Total	9	36	3

This under-representation of rods leads to a second problem, that of the nature of what represents debris from glass vessel production. As has been argued above, it would seem that rods were probably employed mainly as decorative elements in the vessel industry. They were also widely used to form beads, as described by Petrie (TEA 26). It is therefore important to maintain the distinction between 'primary' and 'secondary' material described above. While the term "rods" is widely used in the reports and may confidently be ascribed to secondary glass working material, the primary material is not at all well defined in the reports. In this discussion, the term "fragment of glass" will be taken to indicate the flakes and blocks of primary glass production. It is, essentially, an arbitrary decision, but the term "fragment of variegated glass" seems to have been used to describe vessel fragments. This implies that the term

[13] For the definitions of the terms "primary" and "secondary" see Chapter 2.

"fragment of glass" refers to self coloured material and hence is likely to represent manufacturing debris. In addition, two contexts have been listed as containing primary material, Q42.20 and R42.9 C, on slender evidence. In R49.2C (COA III 132) an "object of white glass" may represent primary material. In Q42.20 (COA III 113), an "incised fragment of blue glass", because of the non mention of any design, and the prevalence of such marks on the flakes in the museums' collections, could potentially be manufacturing debris. It must be stated, however, that any discussion must be highly interpretative (speculative even) when based on such poor data.

Another problem concerns our lack of understanding of glass production methods. This is compounded by the fact that not only was glass subject to a number of different uses and working techniques, but it was also a component of other industries, especially the faience and glaze industries.

Finally, there is a general lack of comparative material on the organization of other luxury technologies in Egyptian society. Potentially the glass industry could have been organised in one of two basic ways; either as a diffuse 'cottage' industry, or as a specialist 'workshop' industry. While a number of variations within these forms of industry are possible, in New Kingdom Egypt, 'cottage' and 'workshop' industries may be linked with certain types of social

and institutional organisations. 'Cottage' industries tended to be associated with private households, with production for consumption by the household. 'Workshop' production tended to be linked to either the palace or the temple. While temple based production also seems to have been primarily for direct consumption, the palace produced both for direct consumption and for wider distribution. It seems that trade, and particularly international trade, was the preserve of the palace (Larsen 1987, Liverani 1979, 1987, Zaccagnini 1983, 1984, 1987). Of course, these two types of industry are not mutually exclusive, and it is possible that they may both be represented at Amarna.

As will be discussed more fully below, the majority of trade and industry was primarily dependant on the palace, but alongside it existed small scale production. Such industry tended to produce small items which did not require either skilled specialists or extensive industrial areas. The resulting products of such industries were largely for consumption within the household rather than for exchange. Typically, a 'cottage' industry would be represented archaeologically by a dispersed distribution of manufacturing debris and industrial installations, such as kilns and furnaces, throughout the settlement. On the other hand, 'workshop' industries tend to be represented by distinct archaeological deposits within a confined area. Within such a context, specialised types of artefact,

potentially related to production needs and methods, for example crucibles or particular tool types, and industrial installations, such as kilns, could be anticipated. The published evidence for both the manufacture of glass and the reworking of glass into objects will be used to infer the organisation of the glass industry at Amarna.

The Distribution Of The Glass Debris

Table 5:2 lists the contexts from which glass debris, primary or secondary, was recorded, and whether glass vessel fragments were found in association. Significantly, the glass debris occurs in a number of different groupings of context types: the Clerks' Houses (COA III 122-3), the Hat Aten (COA II 92-8), Police Barracks (COA III 131-5), King's House (COA III 87-9) and Palace (COA III 35), the Central City Houses (COA III 113-8) and the Northern Suburb Houses (COA II 52-8). Of these only the last is not located in the central city, in the area surrounding the King's House-Palace complex. Such a distribution would tend to suggest that the production and reworking of glass was primarily palace based. However, given the find of both primary and secondary glass debris within private houses it is worth considering the potential for glass and glass vessels to have been produced in household based 'cottage' industries.

'Cottage' Production

In order to establish whether glass was manufactured (ie formed by fusion) in private industries, it is necessary to examine those contexts which have produced primary material, and which are unrelated to the palace or the temple. There are a total of eight: East Street No. 1 (COA I 70), Q42.25 (COA II 117), T34.2 (COA II 66), T36.47 (COA II 55), T36.53 (COA II 53), T36.62 (COA II 57), T36.78 (COA II 52) and T36.83 (COA II 58). Of these contexts, only one., East Street No.1, has produced evidence of more than 2 primary pieces of glass. It seems unreasonable to accept that even a 'cottage' industry would leave such limited quantities of debris behind. Moreover, in none of the private houses is there evidence in the form of kilns or crucible fragments for the initial production of glass. The material from East Street No 1, however, might suggest the fusion of glass, in any case it must be taken as evidence, at least for the reworking of glass, for it is described unequivocally by the excavator as "fragments of molten glass" (COA II 70). The context of this material though, is highly unindustrial, being found in a cupboard in association of objects of a largely domestic function. It seems unreasonable to accept that raw glass was produced by individual households at Amarna on the available evidence. Furthermore, there are strong grounds for associating

Table 5:2 Context And Type Of Glass Artefact Represented

Context	Primary	Secondary	Vessel [14]
Clerk's House 1	-	2	-
Clerk's House 2/3	-	1	-
Clerk's House 17/18	-	1	-
Clerk's House 20	-	3+	-
Clerk's House 32	-	1	-
Clerk's House 35	-	1	-
Clerk's House 40	-	2	1
Clerk's House 46	-	1	-
Clerk's House 47	-	1	-
Clerk's House 50-52	-	2	-
East Street No.1	3+	-	-
Hat-Aten (Central Gate)	-	1	-
Hat-Aten (North Gate)	-	1	-
Hat-Aten (Outside SE)	-	1	-
Hat-Aten (SE Building)	-	1	-
Hat-Aten (Sanctuary SW)	-	1	-
Hat-Aten (Pylon II)	-	1	1
P43.1	-	3+	-
P43.2	-	3+	-
Q42.1	-	2	-
Q42.2	-	2	-
Q42.7	-	3+	-
Q42.16/17	-	1	-
Q42.20	1	-	-
Q42.25	3+	-	-
Q42.28	-	2	-
Q42.29	-	3	-
Q42.32	-	2	-
Q42.33	-	1	-
R42.7	-	3+	-
R42.9A	3+	-	-
R42.9C	1	-	-
R42.10	-	3+	3+
R42.13	-	1	-
R42.14	-	4	-
Royal Mags. (King's House)	1	3+	3+
Servants' Q. (Palace)	-	3+	1
Street A	-	3+	-
T34.2	2	-	-
T35.17	-	3	-
T35.22	-	1	-
T36.41	-	2	-
T36.47	1	-	-
T36.53	1	-	-
T36.62	1	-	-
T36.72	-	2	-
T36.78	1	1	1
T36.83	1	5	-

[14] Numbers refer to the number of finds reported, 3+ is used where the report indicates "many" or other such adjective.

the production of glass with a palace monopoly.

'Workshop' Production

As noted above, there is a concentration of glass production and glass working debris in the central city, in the area surrounding the King's House-Palace complex. It was in this area that Petrie's (TEA 16) palace waste heaps occurred, and it is these deposits which have provided the mass of the evidence for glass production. The full range of glass production debris, crucibles, saggars, blocks, flakes, rods and canes, is only represented in this area. Perhaps more importantly, Woolley reported;

"...to the south of the rectangle formed by palace, temple and government offices...there extended a large and densely populated quarter...occupied by artisans, sculptors' assistants, glass workers, faience makers and the like" (Woolley 1922, 64).

It thus appears that glass production, and potentially glass working were concentrated in an area with a significant royal presence.

There are several aspects of glass production which indicate that it was almost certainly a state monopoly. Perhaps the strongest piece of evidence concerns the use of metals as colourants. Several authors have suggested that the palace held a monopoly on the metal trade and indeed trade in general (cf Liverani 1979, 1987,

Zaccagnini 1987). In his description of the organisation of the economy in the LBA, Liverani has noted:

"Merchants, messengers, prospectors etc. belonged to the palace." (Liverani 1987, 66). While their comments are more specifically addressed to the trade of the metals used in the production of bronze, especially copper, it seems trade was conducted at court level. For instance, the evidence for trade in copper between Egypt and Alasia (Cyprus) is conducted by the Pharaoh and King respectively, and documented in the palace archive (ibid 68). It also seems that trade in precious metals also fell under the auspices of the royal bureaucracy (Zaccagnini 1987, 59). With respect to the colourants employed in the glass industry, two instances will suffice to show how unlikely it is that glass production could have been pursued without state control.

A high proportion of the dark blue Amarna glass, and faience glazes, were produced using cobalt. There is no source of cobalt within Egypt, with the most probable sources exploited being the Great Western Oasis and the Iranian Plateau (Kaczmarczyk & Hedges 1983, 52-53). Kaczmarczyk & Hedges have described cobalt as "a commodity in high demand and not readily available outside the royal workshops and large temple establishments" (ibid 253). Similarly, yellow glass, a colour used widely in decorative trails, was potentially obtained from Anatolia, Iran or the Eastern desert (ibid 105). Such sources would suggest that colourants were

obtained either by international trade, dominated by the palace, or by expeditions, either prospecting or military, again palace dominated. (Witness, for example, the establishment of copper extraction and smelting at Timna (Rothenberg 1988) as a clear indication of palace involvement in metal production.) It seems, given the evidence concerning this royal monopoly of metals, that it would be impossible to produce glass without the support of the palace.

Furthermore, there are a number of reasons which suggest that glass production was the preserve of skilled craftsmen. This is apparent from the complex nature of the fusion of glass, requiring two stages, initial fritting followed by fusion, both significantly affecting the resulting glass. In addition it was necessary to understand the function of colourants. While at Amarna there appears to be considerable experimentation in the production of different colours and different shades, as described elsewhere (see Chapters 2 and 6), the majority of the glass was produced in standardised colours, especially dark blue and turquoise, employed throughout the history of Egyptian glass manufacture. This suggests that at Amarna, the generation of colour was understood, if only through the application of traditional technologies.

Secondly, the production of glass requires controlled pyrotechnology, for its fusion. Not only does this presume skilled operators for the kilns, again

implying specialist production, but furthermore it raises questions regarding the role of the palace in providing raw materials. With respect to the fusion of glass, kilns had to be maintained at high temperatures for several hours at least. Oppenheim et al (1970, 72), note that the Mesopotamian glass texts state that the glass kilns had to be heated at midnight and the fuel had to be kept burning till morning. This would provide a time similar to Turner's minimum fusion time of 5.5 hours (at 1100 -1150 °C) (1954 442). which in Turner's case produced poor quality glass. With similar fusion conditions, Turner produced high quality transparent glass by leaving it to fuse for 16 hours. These times 5.5 - 16 hours provide an indication of the time required to fuse the glass. While the data provided by Mayes (1961 27) concerns a Romano-British pottery kiln, and is thus not directly comparable, it is interesting to note the fuel requirement suggested by his replication. To maintain the kiln at 900 °C for 5 hours 2 tons of wood were required. Although glass working kilns were presumably on a smaller scale than the kiln described by Mayes, the probability that they were heated to greater temperatures and for longer periods, makes it reasonable to suggest that at least a similar quantity of fuel would have been required for the fusion of glass. Secure quantities of such a supply of fuel could only be provided by the palace system at the site of Amarna.

Finally, there are artefacts specifically associated with glass production, notably the crucibles and fritting pans discussed by Turner (1954, 439). The fritting pans were both wheel made and of a standardised size, implying that these types were produced by specialist potters specifically for glass production. Such a standardised production of one of the components of the glass industry implies that the requirements of the industry, and the expectations of the craftsmen relative to their materials, were codified. Rice (1984b 47) has suggested that such standardisation represents the result of craft specialisation. It seems probable, then, that glass production was the preserve of skilled craftsmen. Given the social status of craftsmen as dependants of the palace (Zaccagnini 1983), this further supports the suggestion that the production of glass was a royal monopoly.

It may be suggested that, the necessity of skilled craftsmen, the requirement of kilns and the fuel to supply them, and the evidence for the use of rare metals as colourants in the production of glass indicates that it is probable that glass production was a royal monopoly.

Glass Vessel Production

Given that glass production was apparently a palace monopoly, it may seem reasonable to presume that vessel

production was dependant on the palace. It should be noted, however, that faience and glaze production, both requiring access to glass, were pursued independant of the palace at Amarna. For example in M50.14 (COA I 19), where a pit kiln was discovered with the remains of glass and glaze. This is particularly important as it shows that the pyrotechnology involved in glass working was available, apparently outside royal control. In addition, the limited working of glass outside royal contexts is attested, for example in the manufacture of beads on wire in private houses, eg. Q48.4 (ARV 35). Moreover, there also appears to have been industrial areas outwith the palace, for instance in Street A west of House N49.18, a large quantity of glass debris associated with the manufacture of beads was found (COA I 15). Peet and Woolley concluded from this that "one of the buildings in the neighbourhood was engaged in the manufacture of glass" (ibid). Certainly, there was production of glass objects in this area. Moorey (1985, 204) has argued, based on the distribution of finished glass objects, in Mesopotamia, that a division may have existed between a "cottage industry" producing simple glass objects, alongside the production of more elaborate artefacts within specialised "workshops". It does seem that such a division existed at Amarna. Whether vessels were produced in such 'cottage' industries, however, is open to question on a number of grounds.

The Evidence For Vessel Manufacture

In the absence of a clear understanding of the manufacturing methods employed in vessel production, it is difficult to distinguish what, if any, glass debris is directly related to vessel manufacture, and what is related to other glass objects, glaze and faience production. From the arguments advanced above (Chapter 4) it would seem that primary material was probably used to produce the vessel bodies, and that rods were required for their decoration. Therefore, possible production centres may be expected to possess both types of debris. Only 3 contexts, the Royal Magazines (King's House) (COA III 87-9), T36.78 (COA II 52) and T36.83 (COA II 58) have both types of debris, but the last has no vessels in association. T36.78, although much ruined, appears to have been a private house and thus the possibility of independent production of vessels exists.

T36.78

T36.78 is part of a group of houses built over cellarettes. A number of observations may be made concerning the presence of glass in this context. While it is possible that vessels were being produced here, it is interesting to note the association of moulds for faience, and the presence of several small faience objects, pendants and beads (COA II 89). The

small scale production of simple faience objects is, as mentioned above, testified at Amarna. It seems preferable to consider the material from T36.78 as pertaining to such faience production rather than representing the manufacture of core glass vessels. Even if one was to accept that vessels were manufactured in T36.78, it represents the only context outwith royal control to have produced evidence consistent with vessel manufacture. This by itself would suggest the highly restricted nature of vessel manufacture. Furthermore, in light of the evidence indicating that glass production was a royal monopoly, and the necessity of skilled craftsmen, dependants of the palace, to manufacture the vessels, it would seem unlikely that glass vessels would have been produced in private houses at Amarna. Moreover, the bulk of the evidence suggests that vessel manufacture, like the production of raw glass, was the preserve of the palace.

The Central City

It is worth remarking, once more, on the apparent concentration of glass debris within the central city; an area dominated physically and economically by the palace. Two main areas of the central city have produced concentrations of glass debris and vessel fragments, the area of the Royal Estate and the area of the Palace Waste Heaps in the South East Quarter.

The Palace Waste Heaps

A large rubbish dump, extensively investigated by Petrie (TEA 15-16), occurs in the area between R43.3 and the Police Station R42.10 (COA III 142). The quality of material in these deposits led Petrie to conclude that they represented the "Palace Waste Heaps" (ibid), an interpretation accepted by later excavators (Peet 1921 , COA III op cit). The general character of this area is dominated by R42.8 and 9, an L-shaped complex which the excavators described as the "Military Quarter", and which incorporated "The War Office". In part of this complex, R42.9A, many fragments of glass, drop pendants, inlays and faience were found (COA III 135). Two possible interpretations must be considered relative to glass working in this building.

It is possible that the glass has become incorporated into R42.9A as a result of post depositional erosion of the rubbish deposits, or as a result of poor contextual recording during excavation. If this was so, then a more uniform spread of glass throughout the buildings in this area might have been anticipated, and this is not the case. Moreover, the distinct nature of this deposit is noted in the preliminary report which describes it as a "small hoard of glass" (Pendlebury 1934). It seems likely that glass objects were manufactured in this area, possibly in R42.9A, part of the "Military Quarters". Whether vessels

were produced here, however, remains open to question, but must be considered a possibility. Of course, with respect to the question under discussion here, the social organisation of the glass industry in this official building does indicate state control. This area, like much of the central city, is intimately linked by the presence of public buildings to the functions of the court.

The Royal Estate - Palace Complex

The other major concentration of glass is in the area surrounding the Royal Estate - Palace complex. Indeed, it is the major concentration, with 30 of the 48 contexts which have produced any evidence of glass debris located in this area. Two main areas appear to be connected directly to vitreous production, the industrial quarter to the south of the King's House and the Hat Aten temple workshops (P43.1).

In the area near the King's House (Petrie's House 13), "the sites of three or four glass factories and two large glazing works were discovered" (TEA 22). In the re-excavation of this area Woolley reported that "in this industrial quarter we found this year a centre of glass and glaze manufacture" (1922, 64). Undoubtedly, this area produced a wide range of vitreous objects, and it seems that it presents the most likely origin for the Amarna vessels. It is worth noting, that this area,

because of its location may be considered dependant on the Royal Estate, and it thus seems that vessel manufacture was linked to the palace.

Moreover, the other "industrial" area, the magazines to the south of the Hat Aten also suggests royal domination of the vitreous industry. Pendlebury (1932, 147) described "ovens and glazing kilns all opening off a central gangway". There is, however, no specific mention of glazing kilns in the final report. despite this, there are two reasons to believe that this area was involved with vitreous production, though not necessarily glass working. First, with respect to the non mention of kilns in the final report, it is difficult to misinterpret a glaze kiln with its attendant debris, for an oven intended for bread, or other domestic use. Such a specific reference must be treated as valid. If not, one would have expected the excavators to have stated a corrected opinion on fuller publication. Second, the material from P43.1 includes many moulds for small faience objects and many beads (COA III 105) . It thus appears that this area was involved in the production of faience objects, rather than glass vessel production. It is interesting to note, in passing, that this building, "The Priests' Quarters", is part of the Hat-Aten complex. There are two possible (and compatible) interpretations of the Hat-Aten, that it was the "Chapel Royal" (COA III 92-100), and that it was used by Ahkenaten as the setting for the

distribution of gifts at the "Window of Appearance" (Kemp 1976 95).[15] In either case, the suggestion is that the Hat Aten was an integral part of the Royal Estate. This is emphasised for P43.1, where, while the building was called "(The Storehouse) of Service of The Aten" (COA III 150) also contained bricks with the inscription "Mansion" (ibid). Short for "Mansion of The Aten" (ibid), these bricks are taken as an indication that this building was considered part of the Royal Estate. It thus seems that the production of small faience objects was controlled, in at least one instance directly by the palace.

Before turning to the King's house, one other context which produced primary glass deserves mention. Located in the Scattered Houses to the East (COA III 117), this simple building, seems at first, unconnected to the palace, being in a largely residential area. This building contained bricks stamped "The House of the Rejoicing of The Aten" (COA III 150). The implication of this inscription is that "it must be assumed that in these buildings certain activities connected with the Royal estate and the Great palace were conducted" (COA III 181). While not wishing to suggest that vessels were produced in this building, it is interesting to note that, once again, glass occurs in a building

[15] Both these interpretations will be discussed more fully below (Chapter 9).

directly controlled by the palace.

The King's House

The King's House is central to understanding the organisation of vessel production at Amarna. This building comprised several different areas including the king's private residence and extensive magazines. The King's House provides the focus for the political, economic and ceremonial life of the city (Kemp 1976). As such the presence of primary and secondary glass debris and vessel fragments is of crucial importance. Furthermore, production was located adjacent to this area, and was probably attached directly to the Royal Estate. The intimate connection in the distribution of the glass debris and the King's House is one of the most convincing arguments in accepting the dominance of the palace in the production of vessels.

One function of the King's House was to serve as a storage area for goods, as shown by the shelved areas in the magazines. A depiction of such magazines (although not necessarily the Amarna examples) is known from the Tomb of Meryre' (Davies 1903, Pl XXXI) and discussed by Pendlebury (COA III, 90). In the illustration, the upper left magazine contains "valuables such as vases and ingots of precious metals etc." (ibid). It seems highly probable that the glass held in these magazines represents one type of material stored by the King,

presumably for internal and foreign distribution.

It thus appears, given the concentration of material in the Royal Estate, that the production of vessels appears to have been a royal monopoly. Given the observation above that glass production was almost certainly a monopoly, and that skilled craftsmen were dependant on the palace, this is not an unexpected outcome. It does, however, have implications for the distribution of the finished vessels, and these will be the subject of later discussion.

The Scale Of Production

It would be useful to know the scale of glass production at Amarna, but there is no coherent evidence which may be used to estimate it. Given the demands for glass, both by itself and as a raw material to be used in the production of other vitreous products, it may be suggested that glass must have been produced in continuous, if not extensive quantities. Equally, it is difficult to estimate the extent to which glass vessels were produced. Certainly judging by the number of fragments recovered, there is no need to believe in large scale production of vessels. Small scale production, possibly involving a very few craftsmen (as few perhaps as one?), could account for the number of vessels produced during the sites occupation. It may also be argued that, given the nature of production of

other luxury items, for example faience production which appears to be "carried on in royal ateliers"

(Kaczmarczyk & Hedges 1983, 247) that glass production, and most probably vessel manufacture, were centred on the palace.

Conclusion

While there is evidence that limited glass working, notably the manufacture of beads, and small scale faience production, took place in certain of the private houses at Amarna, there is no evidence that either glass fusion, or the manufacture of vessels, existed as a 'cottage' industry. The distribution of glass debris is heavily concentrated on the royal Estate and its dependancies, indicating an intimate connection. Moreover, this is not unexpected as the palace system in the New Kingdom controlled access to raw materials, craftsmen and to some extent demand. Alongside other luxury items, glass vessel production appears to have been a virtual, if not in fact, royal monopoly.

The Typology And Dating Of The Glass Vessels

This section is concerned with the typology of the glass vessels from Amarna and Gurob and draws heavily on the work of Nolte (Glas.). The reason for re-examining the fragments from these sites stems from the writer's earlier work on a collection of glass vessel fragments attributed to Serabit el-Khadem (Simpson 1988), when the problems in using Nolte's typology to date an assemblage of fragments became apparent. The intention of this exercise was to add the fragmentary evidence to the complete vessels listed by Nolte to make comparisons with other assemblages of fragments, for dating purposes possible. It became obvious, however, that the addition of the fragments to Nolte's descriptions radically alters her framework, and yet still fails to provide a useful alternative scheme.

GUROB

In the fundamental work on Egyptian New Kingdom glass vessels, Nolte (Glas. 82-134) divides the known complete vessels into stylistic groups which she considers the characteristic products of 'workshops'. It is, perhaps, unfortunate that Nolte used the term 'workshops', for she makes it clear that unlike at Malqatta, Amarna and El-Lisht (ibid 22-6), there is no clear indication of the manufacture of glass vessels at

Gurob (ibid 111), and yet it is largely on the evidence from this site that her description of "Workshop 4" is based. There is, however, possible evidence for glassworking at the site, primarily the reference by Brunton and Engelbach to "glass factories" (B&E 3). Unfortunately, the excavators were more concerned with the underlying fort and so it is impossible to say on what evidence these 'factories' were identified. Moreover, their date is very vague, only being described as later than the fort (assigned to the 2nd Intermediate period (ibid)). Petrie (KGH 37) mentions the manufacture of beads at the site, however from his description it seems equally probable that he is describing the manufacture of faience beads as he mentions " moulds for rings and amulets, and beads stuck together in the baking" (ibid). While it is probable that certain glass objects were moulded, from Petrie's work at Amarna (TEA 25-7), and more recent work by Kemp (ARV 35), it seems that the most common method of glass bead manufacture was the 'winding on' of glass rods around copper wire.

There are, however, 2 glass 'blocks' from Gurob, UC 22100 and UC 22848. From the evidence of the Ulu Burun shipwreck (Bass 1986, 181-2) it is apparent that raw glass was traded widely in the Eastern Mediterranean, and so they need not have been produced at Gurob. The find of only two blocks of glass indicates that raw glass was unlikely to have been produced at Gurob and,

moreover none of the preliminary stages of glass production are represented. As discussed above (Chapter 4) it seems that glass rods were an essential component in the production of core-glass vessels, principally as decorative elements. Such material is present at the known working sites of Malqatta (Keller 1983, 19, Lilyquist pers. comm.), Amarna (TEA 25-7), and El-Lisht (Keller 1983 19, Hill pers. comm.). Such rods (and the similar canes) are neither recorded by the excavators or represented in the museums' collections as present at Gurob. That the glass blocks were intended for use at Gurob is probable, but most likely in the manufacture of small beads or perhaps as a component of the glaze for the faience produced at the site. There is however, no convincing evidence to suggest the production of core glass vessels at the site.

Accepting the argument that glass vessels were not produced at Gurob, it is necessary to establish if they represent a distinct chronological group. The first, and weakest, argument is from the vessels themselves, for they do represent a remarkably homogeneous group, especially with respect to the prevalence of feather decoration, but this is of course, a circular argument. Furthermore, from an examination of the evidence from sites at which glass is known to be produced, Amarna (see below) and Malqatta (Keller 1983, 19) it can be shown that there can be great variation in the form and decoration of the vessels produced in a very restricted

timespan.

The contexts in which the vessels were found at Gurob, with one exception, however, do represent a distinct and defined period, that of the 19th Dynasty, specifically the reign of Ramesses II. Of the tombs containing glass only three have evidence which allows them to be dated: Loat's Grave 54 (Loat 7) and Brunton and Engelbach's Tomb 5 and Tomb 34 (B&E 10 and 19-24). Tomb 5 is the burial of a royal prince, and despite the confusion caused by the inclusion of the name of the prince (Ra'messu-mer-Amen (ibid 19-24)) and the addition of the epithet Neb Weben, the inscriptional evidence can be used to securely date the tomb to the reign of Ramesses II. Tomb 34 is assigned by the excavators to the early 19th Dynasty (ibid 10). Loat's Grave 54 is the only one listed with any associated material, and included in this group is a heart amulet (Loat 7) in glass, which may be compared with a similar find in Petrie's 'Group of Ramesses II' (KGH 18). Thus these tombs do represent a distinct chronological group.

There is one complete vessel which needs to be mentioned at this juncture, a lotus beaker (IX) (Ashmolean E.2451), from Loat's Grave 58, published with no associated material. On stylistic grounds Nolte (Glas. 49) assigns this to the earliest period of glass production in Egypt, and given the foundation of the town under Tuthmosis III, this is a possibility. Nolte's

assumption is based on the association of this vessel with the examples of this form with cartouches of Tuthmosis III (ibid 48-49). Although there is little information in Loat concerning the nature of the graves, it seems probable that this vessel was found in a private grave. Given the strong association between the early glass vessels and royalty, it would be an atypical example that occurred in such a private grave. This would seem to indicate that this vessel was more likely to be either a "hold over", or contemporary with the other glass vessels on the site. It is also significant that the lotus beaker form occurs in other materials at a later date than Tuthmosis III, indeed at Gurob there is an example in stone from the end of the XVIIIth Dynasty (B&E Pl XXVIII). As this form was still current in other materials at a later date, it seems reasonable to assume that this vessel was coeval, at the very least in usage, with the other glass vessels from the site.

Petrie's 'house deposits' contained the other contexted vessels. He divided these 'house deposits' into chronologically distinct groups, from Amenophis III to Sethos II (IKG 17-19), on the basis of material with cartouches (a kohl tube with a cartouche of Amenophis III (ibid 17), another kohl tube with a cartouche of Ramesses II (ibid) and a steatite tray of Seti II (ibid 18)) and on the similarity of material in the other groups to other dated assemblages. Given that these are 'closed' contexts (ie. they represent a single

act of deposition) there are arguments which suggest that these deposits are in fact contemporary and represent material of the early 19th Dynasty or later. The nature of these deposits is that they are cut through the floors of houses which extended over the temple enclosure in the reign of Ramesses II (ibid 16), and therefore preclude an earlier date. Secondly, the stylistic developement of the objects is not as marked as to signify a clear chronological division, for instance the inclusion of lentoid flasks in all the groups could be used to support broad chronological contemporaneity. Considering the stratigraphic evidence of a single building phase with subsequent deposition and given that there was no appreciable intervening deposit between the floors of the buildings and the accumulated ('natural') soil above, the pits must have been dug through the floors in or during the period of the existence of the floors. Thus the 'house deposits'

Table 6.1 Gurob Identified Forms

Vessel Class	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Listed By Nolte	1	0	3	1	0	0	6	0	1	3	1
From Frags.	1	0	0	0	0	1	0	1	0	0	3
Total	2	0	3	1	0	1	6	1	1	3	4

NB XI represents 3 bowls and 1 flaring neck vessel.

Table 6.2 Gurob Background Colours

Background Colour	Listed By Nolte		Fragments	
	No.	%	No.	%
Black	0	0	4	10
Dark Blue	6	40	18	45
Brown	0	0	3	7.5
Green	0	0	1	2.5
Light Blue	0	0	2	5
Purple	5	33	4	10
Turq.	4	27	8	20

Table 6.3 Gurob Decorative Motif

Motif	No.	%
Feather	13	32.5
Festoon	2	5
Flame	4	10
Flattened Festoon	1	2.5
R.M.B.	1	2.5
Spaced Festoon	5	12.5
Swirl	1	2.5
None	4	10
Indeterminate	9	22.5

will be treated as a distinct single period. They may reasonably be assigned to the period from the later reign of Ramesses II to the reign of Sethos II. It is thus reasonable to assign the glass vessels and by extension the fragments to this period, that is the late 13th century B.C.

In keeping with Nolte's classification of the vessels from Workshop 4, the evidence from the fragments will be added to her corpus and considered in terms of their morphology, background colour and decoration. It is worth making one methodological note concerning Nolte's analysis and two with respect to the analysis undertaken by the author. Nolte considers kohl tubes (X) separately from the products of the workshops but here those from Gurob are included as the concern is with all the glass vessels represented at the site. Secondly, Nolte's statements concerning "Workshop 4" will be taken as descriptive of the characteristics of the glass from Gurob. Thus comparisons will be made between the evidence from the fragments and Nolte's description, which also includes both vessels from other provenances and unprovenanced examples. Finally, the way in which the fragmentary evidence differs from the complete vessels should be noted. First, it is obvious that less can be learned about the morphology of vessels from fragments than from complete examples. Moreover, except in a few specific examples, there has been no attempt by the author to reconstruct profiles or individual vessels

from the fragments. Furthermore, certain forms, because of their idiosyncracies eg. pomegranate vessels (VIII) are more easily distinguished than others, and it is virtually impossible to differentiate between certain other classes, notably, flasks (I), jugs (II), amphoriskos (III) and spherical flasks (VI). Second, percentages are used for comparative purposes on the following premise; while it may be argued that any vessel could be represented by a number of fragments, in the terms of an assemblage of glass, there is an equal chance of the survival of a similar number of fragments from each vessel of a particular colour and decorative motif. Similarly, in discussing the decoration of the fragments they are all based on the form of decoration on the body. Where a piece is obviously from a neck, and no body survives, this is treated as a body fragment in terms of decoration. This does not seem to have particularly biased the evidence.

Gurob is significant in that it provides the basis for Nolte's description of Workshop 4 (Glas. 111-2), the products of which can be characterised in the following ways. Firstly, she associates a new form the lentoid flask (VII) with this period. Although the previous forms the krateriskos (IV), amphoriskos (III) and jugs (II) persist, it is the lentoid flask which is the dominant form. The background is typically sky blue or dark purple and occasionally dark blue, with yellow, white and dark blue or light blue trail decoration.

Characteristically, decoration is feather motif, used on both the body and neck of the vessel. In discussing Nolte's workshop 4 it is worth considering how if at all, the addition of the evidence from the fragments alters the description of the characteristics of the core-glass industry as represented at Gurob.

The incorporation of the vessel shapes from the fragments does little to alter Nolte's description of the vessel classes represented at Gurob, and the products of Workshop 4 (see Figs 6.1 and Table 6.1). Of significance, however, is the addition of an example of a pomegranate vessel (VIII) (GR1). Secondly, while the spherical flask is identified as a product of Workshop 4, its presence at Gurob is confirmed by GR9. Another piece, the flaring neck vessel (GR5), seems to be an extremely atypical piece, and no parallel is known in glass, but it may be similar in form to a pottery vessel from Gurob illustrated by Loat (Loat Pl II no.32). In any case it shows that there existed, outside the corpus of standardised shapes, experimentation in glass vessel production. The presence of 2 bowl fragments (BM 67750 and GR6), taken in conjunction with the complete handled bowl (Manchester .716) show that this form was more popular at Gurob than a single example would suggest. Moreover, the evidence suggests that this was one of the standard forms of New Kingdom vessels, and perhaps it is time that it was removed from Nolte's "single forms" (XI) and recognised as a

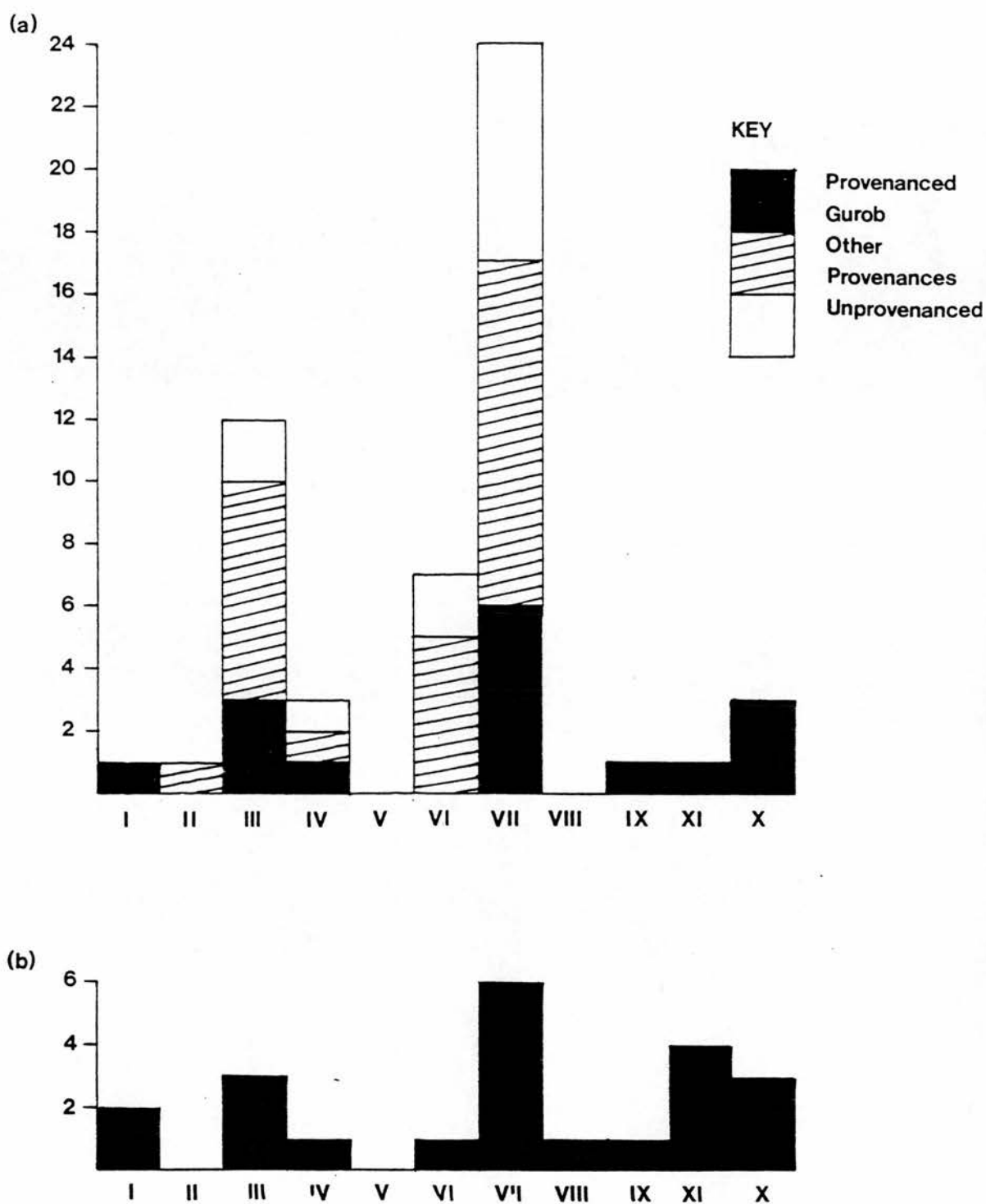


Figure 6:1 Forms Represented: Gurob

widespread vessel form. Finally, it is worth noting that of the recognisable neck forms the majority are narrow, implying the relative infrequency of the krateriskos (IV), which is, in fact, only identified by Nolte from one fragmentary example (BM 90-11-9,3). Thus aside from the addition of the pomegranate vessel, Nolte's assertions about the morphology of vessels at Gurob do seem to be supported by the inclusion of the fragments.

One peculiarity of the fragments is the lack of base fragments, with only one genuine base fragment (GB1) and one fragment (GB2) which seems to be from an apodal vessel, and it is difficult to explain their relative absence. It is possible, though improbable, that there were large numbers of apodal bases but even if this was the case they would still be identifiable in the assemblage. An alternative explanation, though somewhat speculative, would centre on the recycling of glass as a valuable product; in this case base fragments, which are often undecorated would be remelted, either as cullett in the initial preparation of glass, or in the production of small glass objects such as beads or inlays. Such a hypothesis is of course highly speculative and difficult to prove.

In discussing the colours of glass used the following terms are used: dark blue, turquoise, light blue, purple, yellow, white, green, brown, black, orange, pink and clear. With respect to the designations no distinction is made between opaque and translucent

glass for the purposes of the argument. The author continues to use the term 'black', based on visual identification, even though this colour is in fact generally a very dark shade of blue, purple or less frequently brown. It is also worth noting that what Nolte refers to as 'sky blue' is to be equated with the writer's 'light blue' and 'turquoise'.

Nolte (Glas. 111-2) suggested that sky blue and dark purple are the typical background colours, but even by her own listed examples it can be seen that the most common background colour is dark blue with 40% of the vessels this colour (Table 6.2). The fragments reinforce this description (see Table 6.2 and Fig 6.2) with 45% of the fragments having a dark blue background. Moreover, the inclusion of the fragments shows that Nolte overstressed the importance of purple as a background colour, and while it is the third equal most important colour, it represents only 10% of the fragments (16% of the total). Finally the fragments show that other colours were also used for backgrounds, with green, black and brown represented.

In dealing with the decorative motifs Nolte's (ibid 40-1) descriptive categories have been followed. The main form of decoration employed in Workshop 4, according to Nolte, is feather decoration, with festoon decoration seldom used, with the main decorative colours yellow, white, dark blue and light blue. With respect to the decorative motifs (see Table

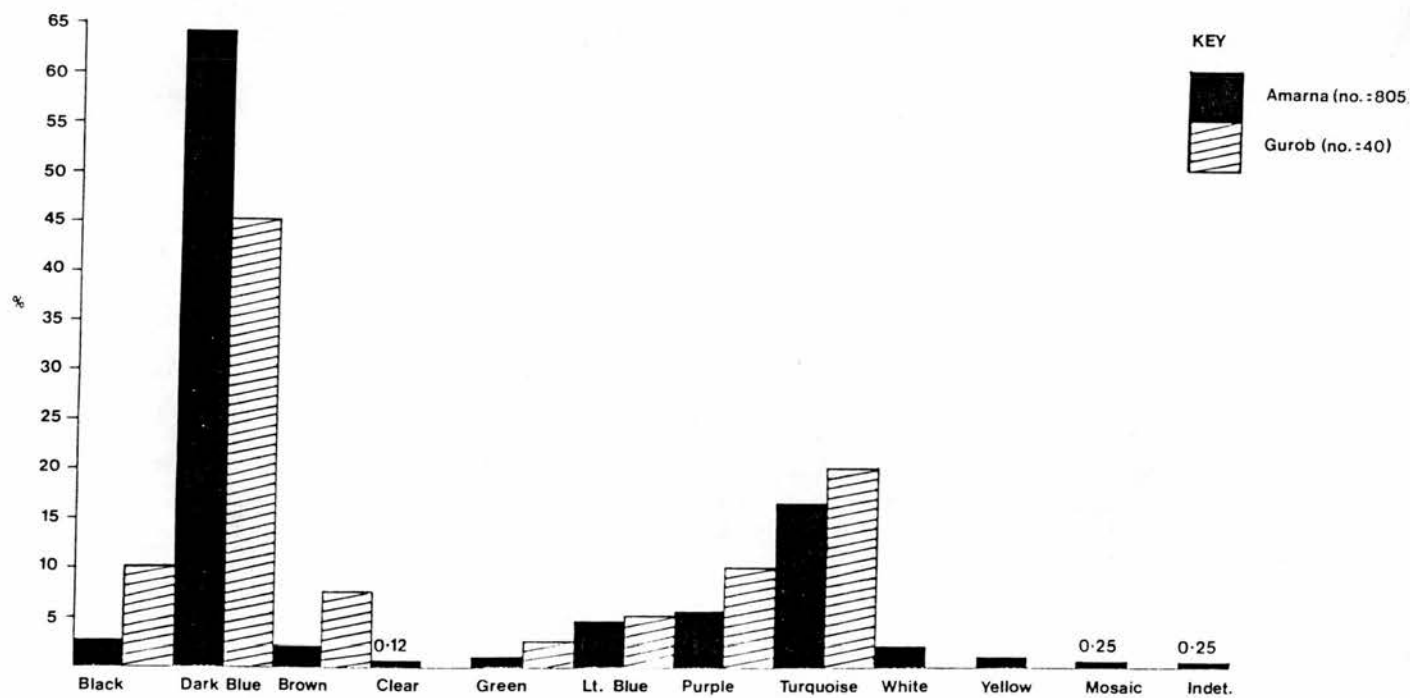


Figure 6:2 Background Colours Represented: Amarna And Gurob

6.3 and Fig 6.3) the examination of the fragments shows that feather (and the related flame decoration) make up the majority of the decoration used. Festoon decoration is represented on 20% of the fragments, and of the 8 examples of this motif, 3 are from the rim or neck of a vessel showing that this decorative motif was seldom used, in this period, as body decoration.

All the combinations of decorative colour include either yellow or white (see Table 6.4 and Fig 6.4), and this seems to be common in Egyptian glass vessels, with a combination of white and yellow trails the most common at Gurob (35.29%) with light blue, turquoise and dark blue used as additional colours. There is only one example of the use of another decorative colour, black (ibid 74 no.5). It is perhaps significant that the present location of the lentoid flask on which it occurs is unknown; therefore the description of it is based solely on Petrie's (IKG 18) record. It is probable that it represents a dark blue that has been misidentified. Finally, the rim fragments at Gurob normally have decorated edges (see Table 6.5 and Fig 6.5), the most common form being an applied twisted rim band in two colours, with its edge unmarverred, giving it an effect like 'rope', with 54.17% of the total, or simple plain bands being used (12.5%).

One fragment which deserves special mention is, unfortunately, only available in published form (B&E 19-24), and is a blue glass fragment with a rounded

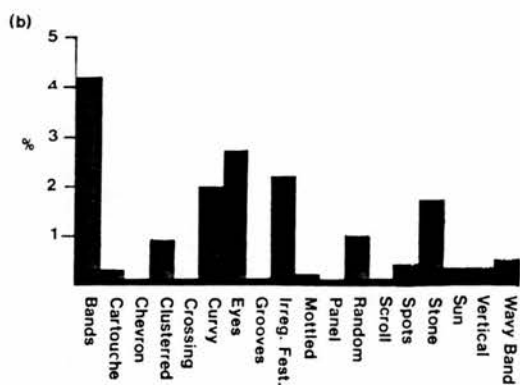
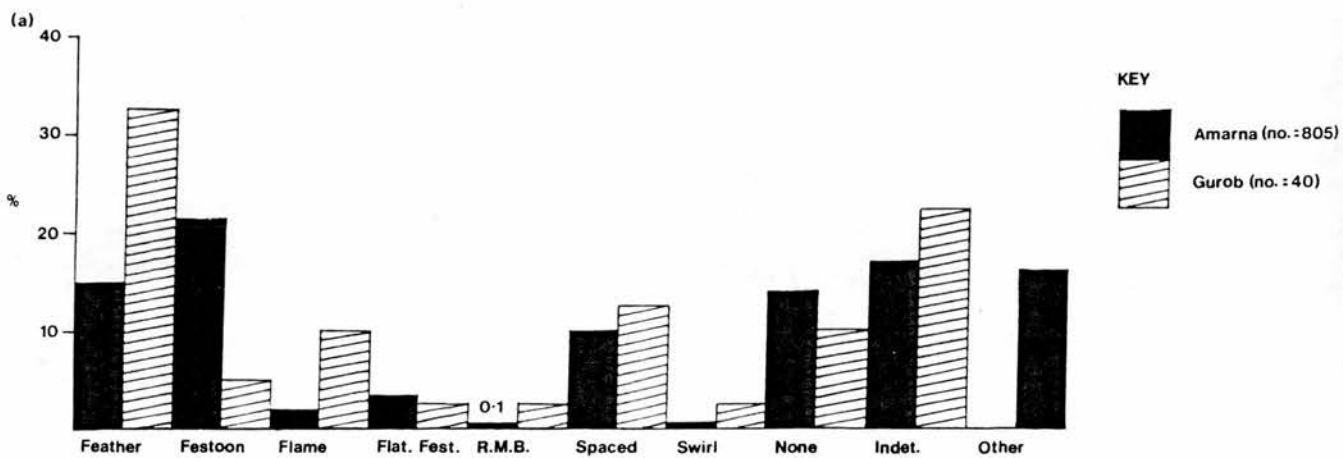


Figure 6:3 Decorative Motif Represented: Amarna And Gurob

Table 6.4 Gurob Decorative Colours

Colour [16]	No.	%
W	1	2.94
W,B	1	2.94
W,LB	1	2.94
W,Y	12	35.29
W,Y,B	3	8.82
W,Y,LB	6	17.65
W,Y,T	6	17.65
Y,B	2	5.88
Y,T	2	5.88
Total	34	100.00

profile and decorated with applied hemispherical 'knobs'. This piece is in appearance very un-Egyptian and it is possible that it represents an import, possibly from Mesopotamia, where similar decoration is used (Oppenheim et al 1970 144 (5) and (6)). While it is possible that this fragment does represent an Egyptian product it is so out of keeping with the other glass that the idea of an import seems an appealing and reasonable one.

[16] In the above table and Table 6.9 the following abbreviations are used; BK - black, B - dark blue, BN - brown, G - green, LB - light blue, O- orange, P - pink, R - red, T - turquoise, W - white, Y - yellow .

Table 6.5 Amarna And Gurob: Form Of Rim Decoration

Amarna			Gurob	
	No.	%	No.	%
RB	32	30.19	3	12.50
SRB	20	18.87	1	4.17
TRB	10	9.43	13	54.17
WAVY	4	3.77	0	0
NONE	40	37.74	7	29.17
TOTAL	106	100	24	100

In discussing her Workshop 4, as indicated at Gurob, Nolte's descriptions were essentially correct, except for her omission of the pomegranate vessel, and her assertion that purple was a particularly widely used background colour.

In general, the glass is well made, with decoration well applied, the trail decoration in the majority of cases is less than 2 mm thick and well marverred into the surface. The technical accomplishment of the feather decoration is such that in most cases the points of the decoration from distinct bands meet, and the horizontal spacing is quite even. There are a few exceptions to this generalisation, GR2 where the bands are irregularly spaced and the fragment is heavily grooved, GR3 where the rim band has been left unmarverred and GF14 which has bubbles in the outer surface. However, it seems reasonable to describe the glass as well made in

technical terms.

AMARNA

Unlike Gurob, as the previous chapters show, Amarna certainly represents a centre for the production of glass vessels. Indeed, Amarna is largely the basis for our understanding of glass vessel production. The history of the new capital of Ahkenaten is such that the material from it represents a distinct chronological group, even considering Kemp's (Kemp 1987b) evidence concerning the slightly longer period of occupation in the Workmen's Village, and represents a period of c 30-40 years from c 1370 B.C.

Nolte (Glas. 101-2) notes the following characteristics of the products of Workshop 3. The most common forms are the krateriskos (IV), amphoriskos (III) and single handed flasks (I) and jugs (II). The most common background colour is dark blue and occasionally sky blue. Feather decoration is the most common motif employed as body decoration, with festoon decoration reserved for use on the neck. Nolte also points to the use of zoning on the bodies of the vessels of this period. Finally, the most common decorative colours are yellow, white and dark blue. In addition she notes the existence of yellow and pale blue vessels decorated with eye decoration.

Unlike Workshop 4, the characteristics of Workshop

3 are based on a site which produced very few complete vessels and many fragments. There are only five complete vessels from Amarna; 2 jugs (II), 2 krateriskos (IV) and 1 fish vessel (XI). Such a small sample for creating an elaborate typology must be suspect. In considering the morphological characteristics of Workshop 3 however, the evidence of the fragments does support in general the characteristics described by Nolte (see Table 6.6 and Fig 6.6), for example 2 classes ascribed to Workshop 3, which are unrepresented at Amarna, the spherical flask and lentoid flask are represented in the fragments (AF7, AF11 and AF8). Whether the amphoriskos is represented at Amarna is more problematic, there are three fragments which the author has assigned to flasks (I), one of which AF13 may represent either a jug or a flask, and the other two (AR59 and AF5) may represent amphorisiskoi. (The distinction between flasks and amphoriskoi is very difficult to be certain about when dealing only with fragments.) The single forms (XI) are primarily bowls but, it is worth noting the fish vessel (BM 55913) (ibid 70 no.5) and the globular alabastron (AR3), both showing innovation in the form and the application of decorative techniques. This illustrates the experimental nature of the Amarna glass industry. While Nolte does not include kohl tubes (X) in her definition of the 'Workshops', AR28 confirms the presence of this ubiquitous vessel form at Amarna.

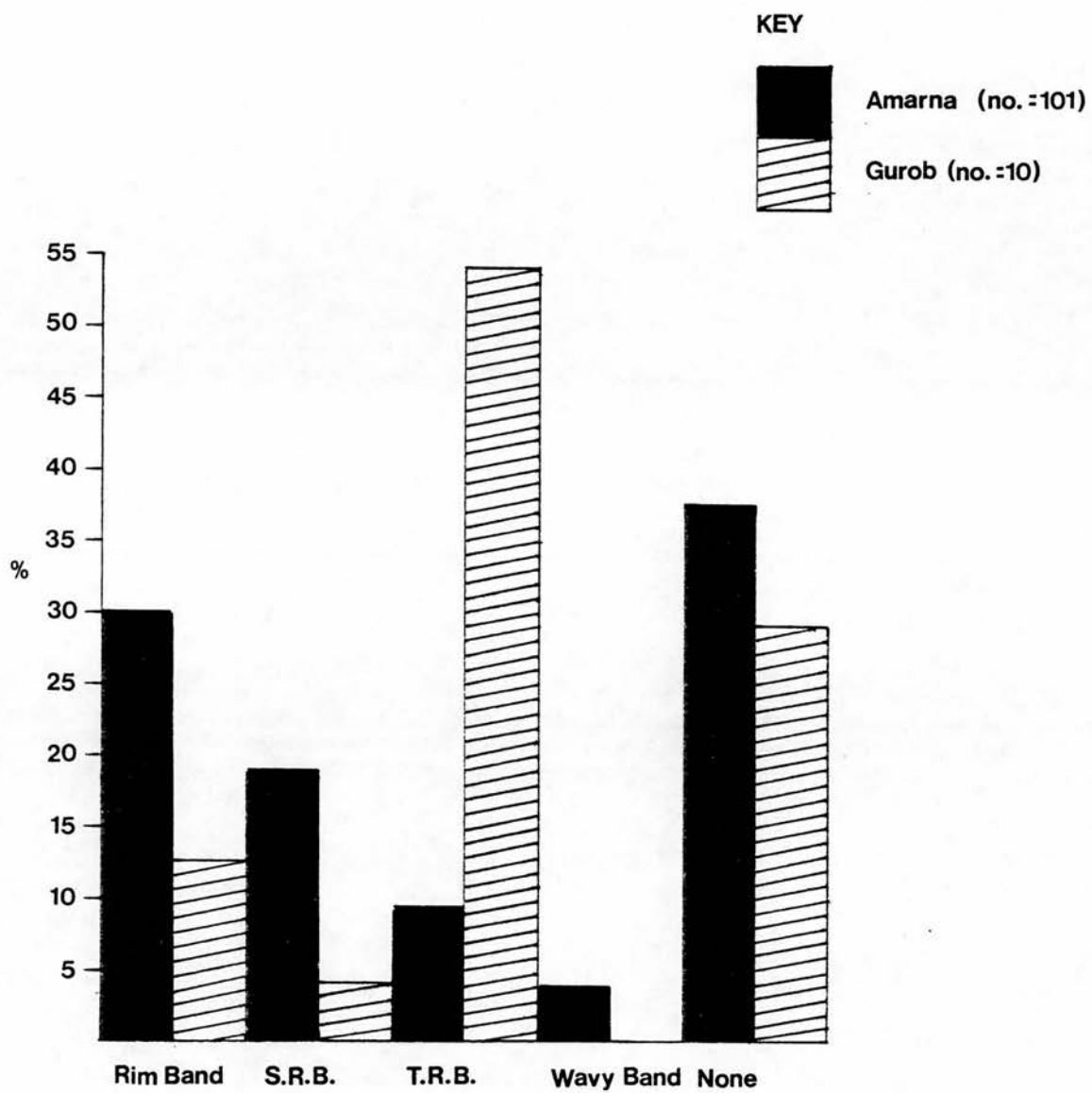


Figure 6:5 Form Of Rim Decoration:
Amarna And Gurob

One pomegranate vessel is attributed by the Petrie Museum to Amarna (AR81), but given the prevalence of this form at a later date, and its non-appearance in another example at Amarna, the tips for instance are easily identified in an assemblage, the writer is unwilling to accept the presence of this form at this date. The relative frequency of the vessel classes supports Nolte's description, with the notable exception of the debated amphoriskos. More importantly, the bowl form (XI) represents the second most common form with 6 examples in the fragments (AR8, AR22, AR44, AR79, AR99 and AR100), further reinforcing the suggestion that this form should be considered as a separate vessel class.

With respect to Nolte's description of background colours, dark blue is the most common with 64.22% of the total (of the fragments). Sky blue (which may be equated with turquoise and light blue) is the second most common with a combined total of 20.74% and purple is the third most used background with 5.59% of the total (see Table 6.7 and Fig 6.2). Although they make up only a small fraction of the background colours at Amarna, it is worth stating that all the colours regularly found on Egyptian glass are employed as background colours including black, brown, green, white and yellow. Moreover, one fragment AF132 has a clear background, and may be the only evidence that transparent glass was used self standing in the New Kingdom. Finally, two fragments AF140 and AF142 are of mosaic construction, known in

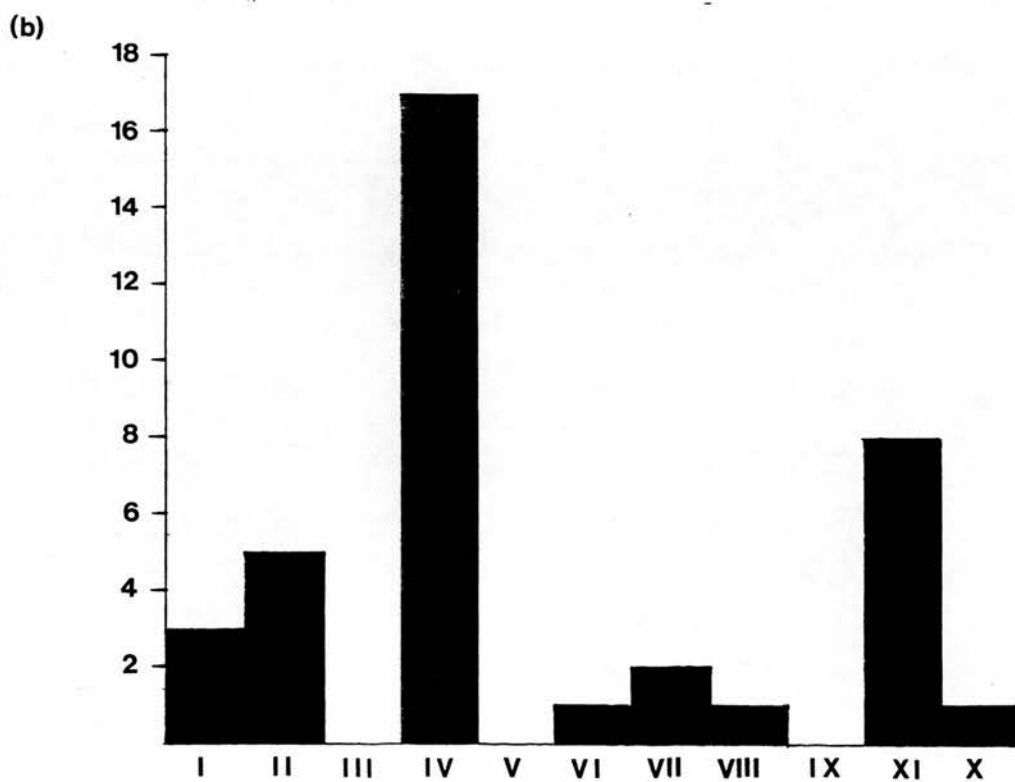
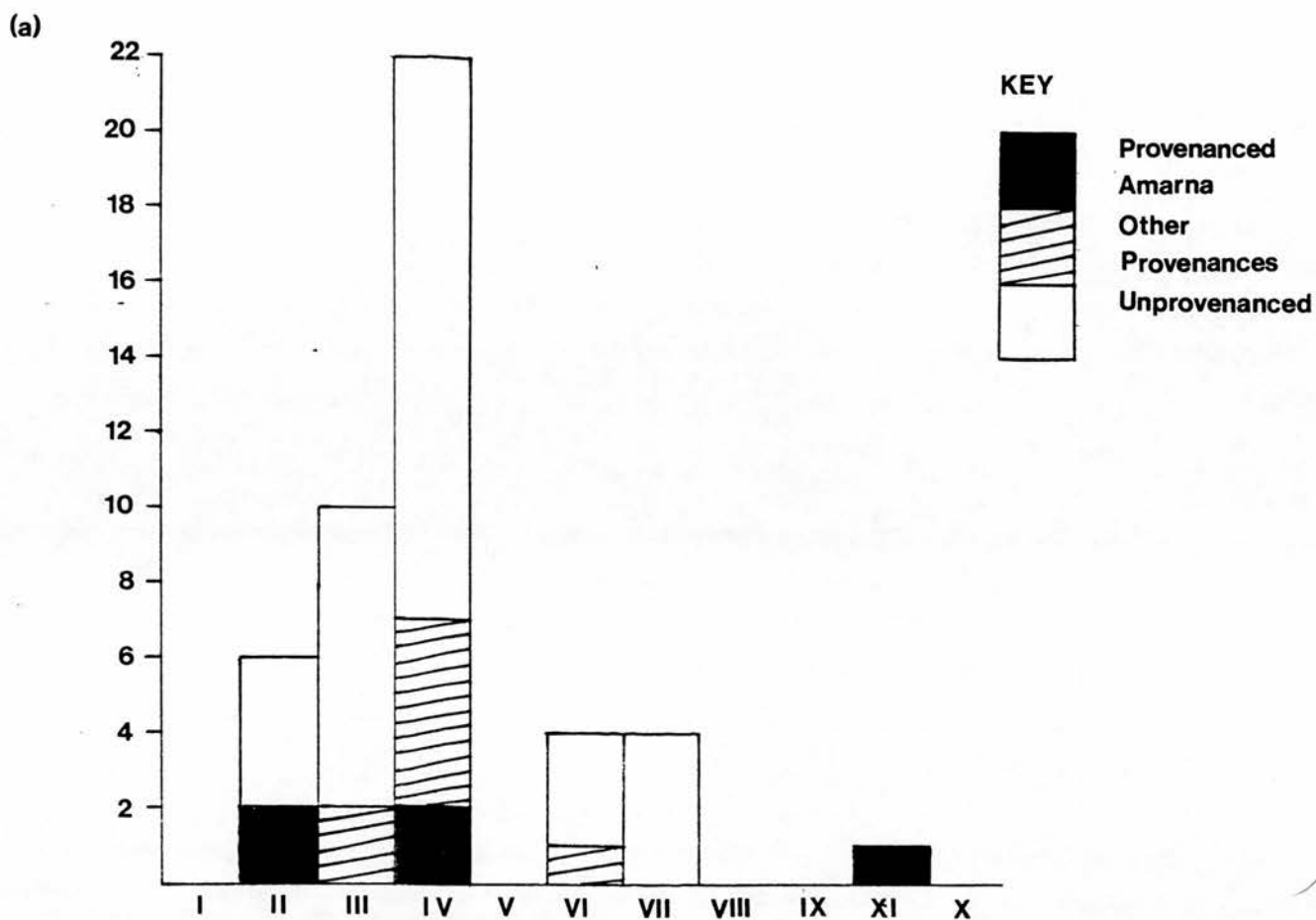


Figure 6:6 Forms Represented: Amarna

earlier periods, eg. at Malqatta (Keller 1983, 21), which represent a rare and complicated technique. Thus, while dark blue is the most typical background colour, a wide variety of colours was also used.

With regard to Nolte's description of the decoration employed at Amarna as feather decoration on the body with festoon largely reserved for the neck, the fragments radically alter this description (Table 6.8 and Fig 6.3). Festoon is the major decorative motif representing 53.06% of the total while feather decoration accounts for only 12.3% of the total (even combining feather and the related flame decoration gives only a total of 14.41%). Furthermore, both festoon and feather decoration are used as both neck and body decoration, indeed no motif seems particularly reserved for use in one particular zone of the vessel.

As with the wide variety of background colours employed, Amarna also presents a wide range of decorative motifs with 26 different variants identified. Of particular interest are the use of grooves (AB6) and panelling (AR31), neither of which are dependant on the use of contrasting coloured glass, which typifies most of the decoration used in Egyptian core-glass. There are also several motifs, including mottling (AF105), spots (AB43 and AF148), suns (AF69 and AF70), eyes (eg. AF54 and AF144) and chevrons (AB11) which are not dependant on the decoration being trailed. Both these characteristics show the innovative nature of the glass

industry at Amarna, and the diverse nature of its products.

Rim decoration, (see Table 6.5 and Fig 6.5) at Amarna, tends to be simple with either the rim left undecorated (37.74%) or a band applied round the edge, horizontal in 30.19% and a wavy band in 3.77%. Where multi coloured bands are used to decorate the rim they tend to be marverred flat (18.87%) giving a striped appearance, although 'rope moulded' bands are used (9.43%). Similarly, bases tend to be left undecorated (60.4%) or have a band on their edge (29.7%), although, again, there are examples of both striped bands (6.25%) and rope moulded bands (4.17%).

Table 6.6 Amarna: Vessel Classes Represented

Vessel Class	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Identified by Nolte		2		2							1
Identified From Frags.	3	3		15		1	2	1		1	7
Total	3	5		17		1	2	1		1	8

NB Class XI includes 6 bowls, 1 fish vessel and 1 globular vessel.

The fragments also show how there is greater diversity in the decorative colours employed at Amarna than Nolte seems to suggest (see Table 6.9 and Fig 6.4).

Yellow and white, in keeping with most Egyptian vessels are the most widely used colours, with either yellow or white being used in 98.47% of the fragments. White is more common than yellow being used in 94.02% of the fragments, while yellow appears on 68.87%. The most common combinations of colours are; white and yellow (33.59%), white,yellow and turquoise (17.18%) and white and turquoise (6.6%), Where a only single decorative colour is used white is the most common (18.25%). Thus white,yellow and dark blue is in fact a relatively minor component of the assemblage representing only 3.68% of the total.

While the major combinations of the colours used at Amarna are fairly typical of Egyptian core-glass in general, there are four factors which seem to be idiosyncratic. First, is the high numbers of colours employed in certain pieces, for example AR5 where 5 colours are used. In addition, there are many fragments with three or more decorative colours employed (32.46% of the total), with several fragments having 4 or more different decorative colours (12 total, equalling 1.84%). Second, is the wide variety of colours used in the decoration, including such rare colours as red, pink and orange. Indeed all the colours known to occur in Egyptian core-glass are represented. Another feature of the decorative colours employed at Amarna is the use of different coloured 'edging' on the decorative trails. The fourth factor is the use of different shades of the

Table 6.7 Amarna: Background Colour

Background Colour	No.	%
Black	20	2.48
Dark Blue	517	64.22
Brown	18	2.24
Clear	1	0.12
Green	9	1.12
Light Blue	36	4.47
Purple	45	5.59
Turquoise	131	16.27
White	14	1.74
Yellow	10	1.24
Mosaic	2	0.25
Indet	2	0.25

Table 6.8 Amarna: Decorative Motifs

Decorative Motif	No.	%
Bands	34	4.22
Cartouche	2	0.25
Chevron	1	0.12
Clusterred Festoon	7	0.87
Crossing Bands	1	0.12
Curvy Festoon	16	1.99
Eyes	22	2.73
Feather	99	12.30
Festoon	175	21.74
Flame	17	2.11
Flattened Festoon	30	3.73
Grooves	1	0.12
Irregular Festoon	18	2.24
Mottled	2	0.25
Panelling	1	0.12
Random	8	0.99
R.M.B.	1	0.12
Scroll	1	0.12
Spaced Festoon	82	10.19
Spots	3	0.37
Stone	14	1.74
Sun	2	0.25
Swirl	10	1.24
Tips	1	0.12
Vertical Lines	2	0.25
Wavy Bands	4	0.50
None	113	14.04
Indeterminate	138	17.14

Table 6.9 Amarna: Decorative Colours

Colour	No.	%
BK	1	0.15
B	2	0.31
BT	3	0.46
BN	3	0.46
LB	1	0.15
T	1	0.15
W	119	18.25
W,BK	1	0.15
W,BK,G	1	0.15
W,B	5	0.77
W,B,O	1	0.15
W,B,T	1	0.15
W,BN	1	0.15
W,G	1	0.15
W,LB	13	1.99
W,LB,O	1	0.15
W,LB,P	1	0.15
W,O	2	0.31
W,P	1	0.15
W,R,T	1	0.15
W,T	43	6.60
W,Y	219	33.59
W,Y,BK	3	0.46
W,Y,BK,B	1	0.15
W,Y,BK,G	1	0.15
W,Y,BK,R	1	0.15
W,Y,B	24	3.68
W,Y,B,G	1	0.15
W,Y,G	15	2.30
W,Y,G,LB	2	0.31
W,Y,G,T	1	0.15
W,Y,LB	31	4.75
W,Y,LB,T	4	0.61
W,Y,P	1	0.15
W,Y,R	4	0.61
W,Y,T	112	17.18
W,Y,G,LB,T	1	0.15
Y	14	2.15
Y,B	5	0.77
Y,B,LB	1	0.15
Y,B,T	2	0.31
Y,T	5	0.77
Y,LB,T	1	0.15
Total	652	100

same colour for example AF91. Thus, the colours employed for decoration at Amarna also shows greater variation than is suggested by Nolte.

It would seem, then, that adding in the fragmentary evidence significantly alters Nolte's description of the workshops, with her work failing to document the full range at both sites. Particularly at Amarna this has led to a gross over simplification of the characteristics of the vessels. The problem arises, however, that a straight descriptive typology based on the presence or absence of certain traits fails to significantly differentiate between the two assemblages. While there are several features of the glass from Amarna that are unparalleled at Gurob, they all represent relatively minor components of the total. Moreover, all of the features of the glass at Gurob are in evidence at Amarna. Therefore conventional typological analysis would fail to differentiate the glass from the two sites.

An alternative way of looking at the glass would be to examine the technological complexity of the finished vessels. Such an approach was pursued by Keller (Keller 1983), in her examination of the glass from Malqatta and El-Lisht. Many of the same problems referred to above, however, are still unresolved. In addition, this method is, if anything, more subjective than the observation of specific typological characteristics, and may confuse stylistic preferences with technological necessity.

Finally, as Keller (ibid 23) observed, differences may arise for reasons other than those of chronology.

Any new chronological scheme based on typology must take account both of the individual traits specific to a single period and the general characteristics of the glass. Furthermore, in order for it to be useful such a scheme must be applicable to fragmentary vessels which represent the majority of the Egyptian evidence. A major problem in devising such a scheme is the lack of published evidence concerning the 'workshop' sites of Malqatta and El-Lisht, and present studies to undertake the full publication of these sites (Lilyquist pers. comm.) will provide a highly valuable addition to our knowledge of the New Kingdom glass vessel industry. Moreover, the problems in devising a chronological scheme for glass are exacerbated by two factors, first the lack of closely dated sites which have produced glass in Egypt, and second the small quantity of glass that is generally recovered (or recorded!) from excavations.

It would be premature (and conceited) to suggest that the scheme presented below is a workable or complete method for the dating of glass vessel fragments. As the morphology of vessels is hard to reconstruct from fragments, and also shows little chronological development, this study concentrates on the decorative motifs and colours employed dividing the vessel characteristics in the following way, background

colour, decorative motif and decorative colour. This method has three stages and employs both qualitative and quantitative descriptions.

The first stage is essentially the same as in the approach adopted by Nolte and depends solely on the presence or absence of particular traits. The second stage involves a comparison of the relative frequencies of each attribute (see Clarke 1968, 133 for definition of "attribute") for which percentages are used to make comparisons possible. The third stage involves taking a new series of measurements on certain decorative motifs, festoon, feather and flame, chosen because they are the most common motifs used. The following measurements are taken on each fragment; the maximum and minimum thickness of the decorative trails, the distance between the points on the decorative trail where the surface has been dragged (point to point) both maximum and minimum, and the spacing of the decorative trails (measured where the decoration has been trailed) again both maximum and minimum (see Fig 6.7) Three values are then derived for each measurement, the average, the maximum and the minimum. This form of analysis hopes to identify specific groupings of measurements indicative of a common stylistic practice, possibly to be identified with a specific workshop or even a particular artisan.

In applying this method to the vessel fragments from Gurob and Amarna, the following features became apparent. As observed above, with respect to the

background colour, decorative motif and decorative colour, a wider range is represented at Amarna than at Gurob, with all those of Gurob present at Amarna. In considering the frequency of background colours, there is a greater percentage of dark blue backgrounds at Amarna, while at Gurob there is a higher relative occurrence of black. Significantly however, the three most common backgrounds at each site are dark blue, turquoise and purple ^{occur} and in the same order in frequency of use.

With respect to the decorative motifs, there is a major difference between the two assemblages. Festoon (all variants) represents 40.76% at Amarna and only 20% at Gurob, while feather is the prevalent motif at Gurob with 32.5% but constitutes only 12.3% of the Amarna fragments. The other major difference between the two sites is in the form of rim decoration, with Amarna having (aside from undecorated forms) mainly plain rim bands 30.19% as opposed to 12.5% at Gurob, while the twisted rim band is the most prevalent form at Gurob, 54.17%, compared with only 9.43% at Amarna. The largest difference in the decorative colours is in the combination of white, yellow and light blue with only 4.75% at Amarna and 17.65% at Gurob.

In considering the measurements of the decorative motifs in general terms, Amarna shows a greater range of measurements than those for Gurob. Significantly however, there is little variation between the means,

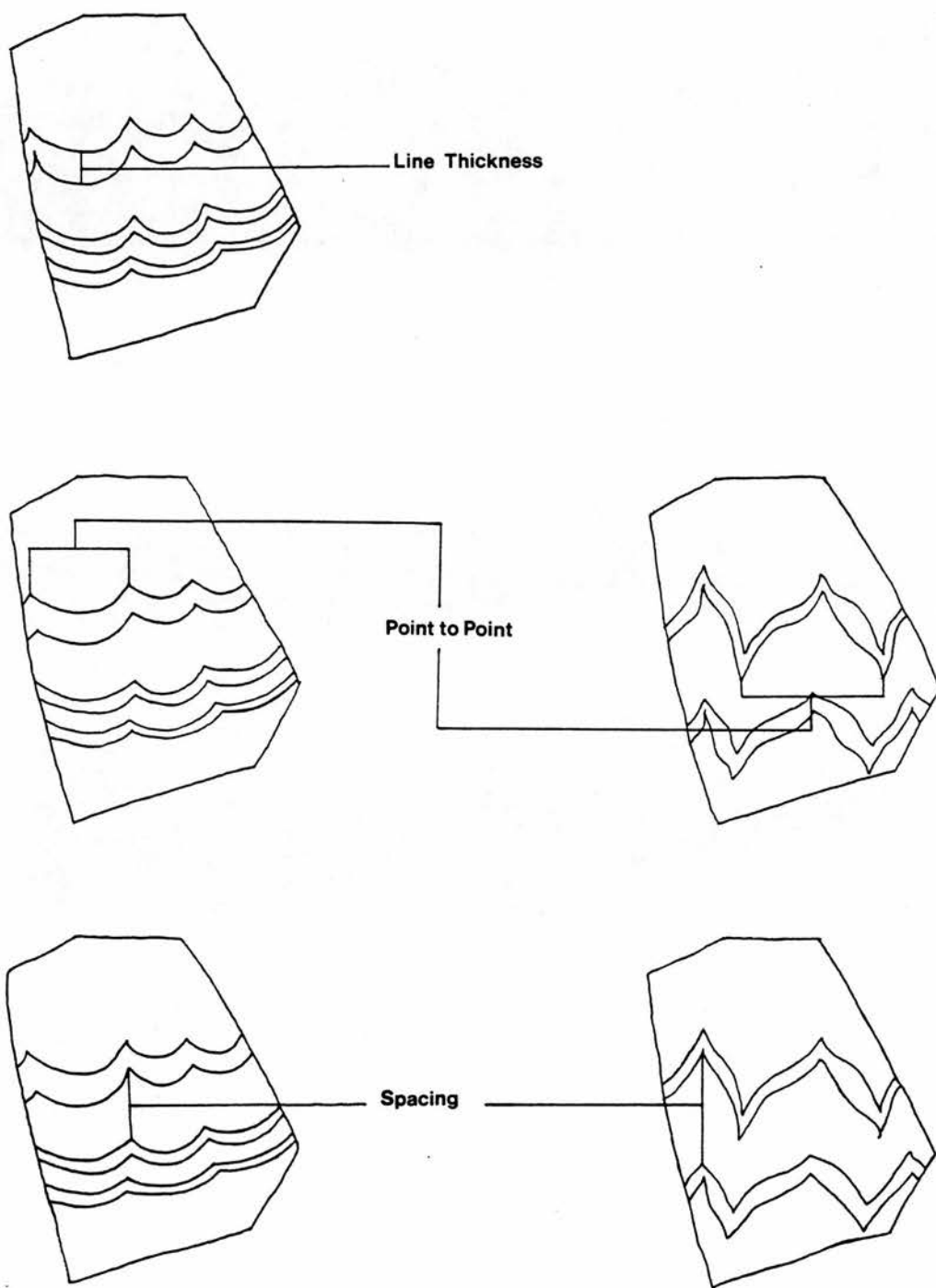


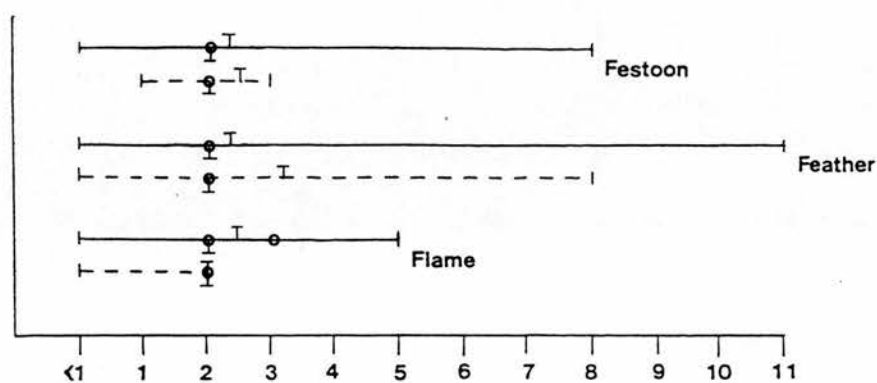
Figure 6:7 Position Of Measurements On Decorative Trails

medians and modal measurements between the two sites' vessels. The greatest variation between the two sites occurs in the point to point measurements of the festoon and feather decoration.

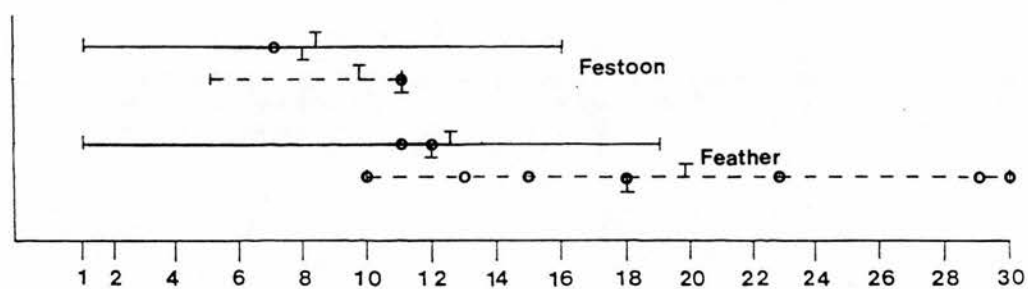
In the festoon decoration (see Table 6.10 and Fig 6.8), at Amarna there is a greater range in the maximum thickness of the trails employed. Both at Gurob and Amarna, however, there is a tendency to use trails with the same thickness (2mm). The main difference in the festoon decoration is in the spacing of the trails, both horizontally and vertically. In general terms the festoon decoration at Amarna has the points of the decoration closer together than at Gurob. In addition at Amarna the festoon decoration tends to be spaced such as to leave only a narrow band of the background colour visible between the trails. At Gurob, the points of the festoon are not only more widely spaced but there are larger spaces of background colour between the trails.

The feather decoration shows greater differences than that of the festoon decoration (see Table 6.11 and Fig 6.8). Again there is a greater range of line thickness employed at Amarna than Gurob, but the tendency at both sites is to use quite thin trails in the feather decoration (again 2mm). Moreover, there is a significant difference in the horizontal spacing of the points of the feather decoration, with Gurob showing a considerably wider spacing. In addition, while all the examples from Gurob show no or minimal vertical spacing,

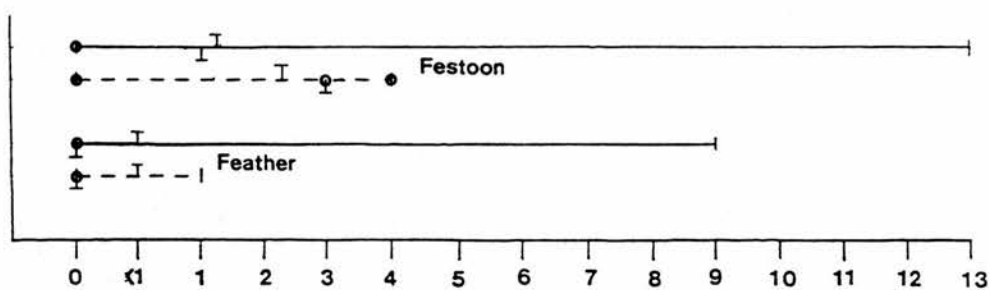
Line Thickness



Point To Point



Spacing



KEY

— — Amarna	T Mean of maximum measurements (mm)
- - - Gurob	o Mode - - - -
	⊥ Median of - - - -

Figure 6:8 Range Of Measurements On Decorative Trails

while at Amarna there is use of distinct vertical spacing in the feather decoration. Thus the feather decoration at Gurob seems to occupy more of the surface of the vessel compared with that at Amarna.

The thickness of the trails used on the flame decoration shows no appreciable difference between the two sites, although Amarna once again exhibits a wider range of measurements. (see Table 6.12 and Fig 6.8).

Table 6.10 Festoon Decoration Measurements

AMARNA

	Max.	Min.	Max. PP	Min. PP	Max. Sp.	Min.
Sp.						
Average	2.2	0.8	8.2	6.8	1.8	<1
Median	2.0	1.0	8.0	7.0	1.0	0
Maximum	8.0	4.0	16.0	11.0	13.0	5.0
Minimum	<1	<1	1.0	<1	0	0

GUROB

	Max.	Min.	Max. PP	Min. PP	Max. Sp.	Min.
Sp.						
Average	2.4	1.8	9.8	7.5	2.3	<1
Median	2.0	2.0	11.0	8.0	3.0	0
Maximum	3.0	3.0	11.0	10.0	4.0	3.0
Minimum	2.0	1.0	6.0	5.0	0	0

Table 6.11 Feather Decoration Measurements

AMARNA

	Max.	Min.	Max. PP	Min. PP	Max.Sp.	Min
Sp.						
Average	2.3	<1	12.2	9.0	<1	<1
Median	2.0	<1	12.0	9.0	0	0
Maximum	11.0	4.0	19.0	10.0	9.0	4.0
Minimum	<1	<1	1.0	<1	0	0

GUROB

	Max.	Min.	Max. PP	Min. PP	Max. Sp.	Min.
Sp.						
Average	3.2	1.0	19.0	-	<1	0
Median	2.0	1.0	17.0	-	0	0
Maximum	8.0	4.0	30.0	-	1.0	0
Minimum	1.0	<1	9.0	-	0	0

There are several problems associated with the method proposed above. First, is the very restricted nature of the present work, only the study of all the dated assemblages would provide an overall framework. Such a study is, by itself, a major undertaking requiring the systematic recording of many fragments. Moreover, there are few well dated sites with glass vessels recorded, providing a limited base for close

Table 6.12 Line Thickness Flame Decoration (Amarna & Gurob)

	Amarna		Gurob	
	Max.	Min.	Max.	Min.
Average	2.4	<1	2.0	<1
Median	2.0	<1	2.0	<1
Maximum	5.0	1.0	2.0	<1
Minimum	1.0	<1	2.0	<1

analytical studies. The other major problem in devising a sensitive scheme for glass vessels, with respect to the above method, is that the small size of many of the assemblages, as in the case of Gurob, with a total of only 71 fragments, may overstress the importance of particular motifs and colours, and thus invalidate the use of comparisons based on percentages. There are also methodological considerations which may make this method akin to catching butterflies with a sledge hammer. It is important to remember that the measurements are taken in millimetres, and it is a moot point whether variation in the order of under three millimetres is significant. There are also problems in taking the measurements. In practical terms, at this scale, using dividers (a convenient method) relatively accurate measurement to the nearest 0.5 mm is possible, but at 1mm the measurement becomes increasingly difficult and inherently inaccurate. Furthermore, it is interesting to

note that the variation occurs particularly in the maximum and minimum values, and these constitute 'end point' values. In statistical terms conclusions based on these values have less validity because of the potential for erratic values.

In application, as noted for devising the scheme, small assemblages and single finds, would be hard or impossible to place chronologically, because of the difficulty of making comparisons based on percentages. A further complication is that where an assemblage of glass vessels is, or may be, mixed chronologically (as in the case of Serabit el-Khadem which prompted this revision), it is impossible to separate the material in to its relevant periods, and this again invalidates conclusions based on percentages of the total. Thus there are several problems associated with the proposed method, and only a study of closely dated assemblages would verify if it is workable. It is however, the writer's opinion that, unfortunately, given the nature of the evidence it would be found to be inapplicable in practice.

Accepting that it would prove to be difficult, or probably impossible, to construct a chronologically sensitive typology, it is worth considering the purpose and intent of typological studies with respect to core-glass vessels. The first use of typology is simply descriptive, by providing a standardised series of categories, and with respect to this Nolte's framework

provides the necessary basis for such a function. Secondly, it is tacitly assumed by archaeologists that the seriation of objects is an essential component of their study, despite the work of the 'New Archaeologists' (Marquardt 1978 for review) in challenging this view. While seriation and typological studies do provide the essential chronological framework for many sites, it is worth noting that the most useful of these is still pottery studies, because of the widespread and 'mass' produced nature of ceramics. Glass vessels, however, because of their relative scarcity, and as a result of the technology employed in their manufacture are less susceptible to such seriation. Moreover, it is worth noting that where glass is contexted, it is nearly always associated with other objects, and is not used as primary dating for that context. It is better to rest the dating of glass on associated objects, rather than any intrinsic characteristic of the vessel fragments. While an objection can be raised that adopting such a policy would mean that unprovenanced vessels would remain undated, it is the writer's assertion that archaeological evidence taken out of context, (however vague the contextual information may be) is not archaeological evidence.

In its own way, however, the very similarity of the majority of the glass vessels from Gurob and Amarna, given their temporal separation, indicates certain

characteristics of the glass vessel industry. The broad similarity represents the conservative nature of the glass working tradition, and this may be explained either by reference to technological or cultural features. The physical characteristics of the glass, particularly its working properties, undoubtedly restricted the appearance of the vessels. Certainly, the prevalence of trailed decoration is primarily because of the wide applicability of this technique. Similarly the colours employed were the result of access to particular metals, and an understanding of the effects of these colourants. However, given that there are many more effects attainable with the techniques employed, the restrictions on the morphology, decoration and colours used are almost certainly culturally determined rather than a function of the technology.

The conservative nature of the Egyptian glass vessel industry is not atypical within New Kingdom society. This conservatism may simply be a response to a demand for the familiar i.e. implying demand based production for the consumer. With respect to this, the association of glass vessels with the royal court may imply that styles were dictated by the palace. Significantly, there is a difference in the diversity of the vessels fragments from the site, with Amarna possessing far greater diversity than those from Gurob. The Amarna period saw a revolution in many of the arts with, apparently, far greater freedom to explore new

forms and techniques. It is possible that the diversity of the vessels may be explained by reference to the prevailing taste of the court. Thus, the small minority of pieces which are represented only at Amarna, may be viewed as experimental work. It is possible that they may have been associated with the heretical innovations of Akhenaten, and their absence from Gurob may be explained as a return to the 'canons' of Egyptian glass working. It is also possible that this diversity could be explained in terms of the mode of production of the vessels and the organisation of glass working. The evidence from Gurob, because of the homogeneity of the vessels would suggest very limited glass production, possibly even the work of a single craftsman. Amarna, however, could potentially have had several different craftsmen/workshops, and this may explain the greater diversity in the vessels.

The evidence, however, suggests that the broad similarities between the vessels from Amarna and Gurob argues for a conservative tradition in the glass vessel industry, with parallels for nearly all the fragments from Gurob at Amarna.

The Significance Of The Typology Of The Glass Vessels

Most typologies have been constructed, and interpreted with respect to chronology, as in Nolte's approach to the glass vessels. With respect to such an approach, Marquardt (Marquardt 1978, 25) has stated "Although seriation is frequently used by archaeologists as a dating technique, it can be presumed to be such only if ordering chronological indicators." As has been shown above, glass vessels are not susceptible to such chronological precision. It is important to remember that chronological seriation depends on the identification of traits that change through time. These traits were not produced primarily as chronological indicators, but rather express the "stylistic grammar" of a "self defined group" (Conkey 1978, 68). Thus the specific forms employed in the glass vessel industry are representative of the ideological and iconographical beliefs of the craftsmen who produced the vessels. The approach employed below, consists of a consideration of the "attributes" (for definition of "attribute" see Clarke 1968, 133) of glass vessels seen as skeumorphic adaptations from vessels in other materials.

Methodology

In the following section certain typological characteristics of the glass vessels from Amarna and

Gurob will be considered as representing skeumorphic traits associated with vessels in other materials. The present survey is limited to vessels in pottery, stone, metal and faience. By discussing certain attributes, in particular the vessels' morphology, it is possible to understand the glass vessels in terms of function and their symbolic significance. Certain of the attributes can also be shown to possess "iconic" (Fritz 1978, 39) values, which may be linked both to the cultural values, and to the idiosyncracies of the two sites.

In discussing the morphology of the vessels, it is worth noting Ericson and Stickell's observations concerning typological studies of ceramics (Ericson & Stickel 1973, 357). In particular, are their observations that;

- a) Ceramic vessels primarily functioned as containers.
- b) That their intended function defined their morphology.

This approach has received widespread acceptance in ceramic studies, focussing attention on the use of vessels rather than adopting an art historical approach. Valuable insights have been gained by this approach (eg. Merrilees' (Merrilees 1968) suggestion that bilbils were opium containers). In order for such analysis to be undertaken, it is necessary to establish that glass vessels were intended to be functional objects.

A number of objections may be raised to such a proposition. Firstly, that glass vessels did not serve

as cooking or industrial containers is a certain assumption. In functional terms they are completely impractical for such purposes. A second consideration is the small size of the vessels, of those from Amarna and Gurob, the largest (Cairo J.46955)(Glas. 69 no.5) is 13cm high while the smallest is only 3.9cm (BM 64339) (ibid 74 no.4). This miniature lentoid flask from Gurob seems most probably, to represent an ornamental rather than a functional vessel. It does remain possible, however, that the larger of the glass vessels did serve a practical purpose. It has been suggested that they served as containers for expensive perfumed oils. If a single use is proposed, then given the typological variation, it appears that their function did not necessarily define their morphology. Seen in relation to similar forms in other materials, however, it can be argued that certain of the glass vessels do represent functional items.

The skeumorphic nature of the morphology of Egyptian glass vessels was noted by Newberry who stated that the vessel forms "were nearly all derived from well known alabaster or pottery forms" (Newberry 1920, 157). It has been tacitly accepted that given the colours of glass employed (discussed below) that it was treated as a substitute for stone in the Late Bronze Age. However, such a premise seems untenable for the period under discussion. While there are links between the stone and glass vessel industries, there are also connections to

vessels in faience, pottery and metal. Moreover it is inconceivable that the end product, the decorated vessels could be confused visually with a stone vessel. Importantly, the high degree of polychrome, elaborate decoration characteristic of glass vessels is entirely absent from examples in stone. The features of the glass vessels, then, are best seen as a combination of attributes represented in other materials.

The traits of the vessels described above, (Chapter 6) were compared with those in other materials and the following considerations undertaken.

- 1) How widespread a particular trait was in a particular material.
- 2) The cultural origin of this trait.
- 3) Whether there was a functional designation attached to the particular trait.
- 4) Whether such a functional designation could be supported for the example in glass.
- 5) Whether there was a symbolic significance to particular traits.
- 6) Whether such a symbolic significance could be expected to be maintained in the context of New Kingdom society.

Morphology

The work of Nolte (Glas. 160-178) is highly valuable in providing illustrations of the vessels'

morphology, and formed the basis of this comparison with vessels in other materials.

Flasks and Amphoriskoi

While Nolte makes a distinction between the flask and amphoriskos, the general shape of the vessels listed by Nolte from Gurob (Brussels E.615 (ibid 138 no. 11), BM 90-11-9,2 (ibid 71 no. 2), Berlin 20578 (ibid 73 no. 1) and Fitzwilliam E.69/1921 (ibid 119 no. 39)) is almost identical, with the only difference being the presence of handles. Therefore, here they will be considered as representing the same form. A similar form is listed by Radwan (Radwan 1983 Taf.70 394-7 and 401-2) in metal. The necks on the metal vessels are, however, longer and the bodies are more ovoid, so it seems unlikely that the glass flasks and amphoriskoi are imitative of metal forms. In stone, Petrie (FFSV nos. 508, 509, 875 and 876) lists 4 examples which represent reasonable parallels for this form but these belong to Dynasty VI-XII. This discrepancy makes it unlikely that the stone jars formed the prototype for the glass flasks and amphoriskoi. The glass vessels' form seems rather to be derived from a Palestinian pottery type, Amiran's "Caananite Jar" (Amiran 1969, 143). Indeed, Amiran (ibid) points out the similarity of the glass amphoriskos from Lachish (Jerusalem 34.7706) (Glas. 119 no. 41) to the Caananite jar. This pottery form is well

represented as imports into Egypt for example at Amarna (COA III 139 Pl LII LXXIII/104) and in the tomb of Tutankhamun (Carter & Mace 1963, 149 Pl L (C)).

Moreover, this jar was copied in local Egyptian wares in the XIX Dynasty (Amiran 1969, 142). The identification of the flask/amphoriskos in glass with the pottery shape seems to be secure.

In considering this form, Amiran links them to the Palestinian trade in oil and wine based on representations in tomb paintings and their wide distribution outside Palestine. Interestingly, there appears to be a differentiation between jars intended for transportation and decorated vessels intended for domestic use. It is the latter form, the 'domestic' jars which represent the closest similarity between the glass and pottery forms. Given that the vessels seem to have an associated function, as containers for imported oil or wine, it is worth considering whether the glass vessels could have served a related purpose. They were not, of course, containers for the bulk transportation of liquids! It is possible that the containers were used as secondary vessels for, say, the serving of wine, but this is a tentative suggestion. Equally it could be that there was a specific association with an exotic, ie Palestinian culture.

Jugs

The ovoid bodied jugs with single handles listed by Nolte (Glas. 69 no. 3 (Cairo J.46955) and 70 no. 4) are both from the same context at Amarna. Again, this form is a common form in Palestinian pottery. Amiran (Amiran 1969 160) states that they have a long history dating back to the MBII period, and that they cease to be 'fashionable' in the LBI period, that is, prior to Amenophis III. There are also Egyptian examples in metal listed by Radwan (Radwan 1983 386A, 386B, 388, 389, and 390). Perhaps the best parallels for this form are the metal juglets from Megiddo (Gershunny 1985 Pl 12 128 and 129) and, significantly, this group represents part of the "Southern" group of vessels. These are the most influenced by Egyptian culture. Gershunny (ibid 46) argues that because of the consistent association of strainers with these jugs they represent "wine sets". The use of such wine sets is attested at Amarna in a tomb illustration (Davies 1905a Pl 32). That the glass vessels from Amarna probably represent part of a wine set is indicated by the objects found in association with them. These include 2 metal vessels, one of which is a strainer jug, and an open ended tubular vase which has been interpreted as a drinking tube. The size of the vessels is considerably smaller than the maximum size of the metal examples, but they are similar in size to two examples from Thebes (Radwan 1983 386A and 386B), which

are 12cm and 13cm respectively, while the glass vessels are 11.5 and 13cm high. It seems, then, that the jugs were part of a wine set and hence it can be argued that, at least in some cases, glass vessels did serve a functional purpose.

Krateriskoi

The complete krateriskoi from Amarna (Copenhagen 9199 (Glas. 69 no. 2) and Brussels E .6354 (ibid no. 1)) represent essentially the same shape, the major difference being in the handles, one with loop handles , one with strap handles. In addition at Amarna is AR101 which seems to represent a plain krateriskos shape similar to that of an unprovenanced vessel listed by Nolte (ibid 129 no.5). In addition there are many krateriskos fragments from Amarna and a fragment of a krateriskos from Gurob (BM 90-11-9-3)(ibid 72 no. 3), the profiles of which can not be reconstructed. The broad shape of the handled krateriskos is paralleled in Egyptian pottery for instance at Amarna (COA I Pl LII XLIX/49). There are also broad parallels in metal, although without handles listed by Radwan (Radwan 1983 Taf.66 365-366), and also examples with one handle (ibid Taf.66 372-4, Taf.67 375-382, Taf. 383-5). It is, however, a form intimately associated with stone vessels, with many broad parallels (FFSV Pl XXXIII 848, 855, 856 and Pl XXXIV 883-5), and with exact parallels

for the krateriskos with loop handles dated to the end of the XVIIIth Dynasty (Carter & Mace 1963 Pl LXVIII (B), Thomas 1981, 147). Significantly, this form, originating in stone is said to be imitated from the end of the XVIIIth Dynasty (FFSV 13). It seems reasonable to assume then, that in this instance the prototype of the glass vessel was an Egyptian form in stone. There has been little analysis of the function of stone vessels, and it is impossible to ascertain the function of the stone krateriskoi. Certain of these vessels (Carter & Mace 1963, 149) may have functioned as lamps, or alternatively incense burners, but given that there is no observed blackening on the interior of the glass vessels, such a function is unlikely. It is highly likely that the krateriskos shape was not functionally determined with respect to the examples in glass.

Spherical Flasks

The spherical flask is represented at Amarna and Gurob only by fragments (AF7 and GR9 respectively) and so there is no detailed knowledge of their morphology. As a vessel form the spherical flask is common in pottery, for instance in the "house deposits" at Gurob (IKG Pl XVII (2), (3) and (40), Pl XVIII (21)). There are both Egyptian wares (ibid Pl XVII (2)) and imported Aegean spherical flasks (ibid Pl XVII (13)). This pottery form was also imitated in stone in the

XVIII-XIXth Dynasties (FFSV nos. 915 and 918, IKG Pl XVII (42)), Given the prevalence of this form in the later XVIIIth Dynasty, and the correspondence of this shape to the Aegean examples, it is tempting to propose an Aegean origin for this form. Typically, however, the spherical body form of the Aegean vessels is accompanied by a "false" neck, and this seems unrepresented in glass. There is then, no convincing evidence for the association of this shape with a particular cultural origin or function.

Lentoid Flasks

The lentoid flask is represented at Amarna by two fragments, AF8 and AF11, and at Gurob by several complete examples (Man. 16 (Glas. 73 no. 2)[17], Man. 727 (ibid 74 no.2), BM 90-11-9,1 (ibid 74 no.2), BM 90-11-8,1 (ibid p71 no. 1) and a missing vessel described by Nolte (Glas. 74 no.5). This form is represented in stone, with an example with a cartouche of Ramesses II (FFSV no. 917). At Gurob there are two examples from Petrie's Group 705F (B&E Pl LIII) in alabaster. There are also examples in faience, eg. the Bes lentoid flask from Gurob (IKG Pl XVII). It is, however, a form which is primarily represented in

[17] This lentoid flask was originally part of a double vessel.

pottery (Loat Pl III no. 95 and B&E XXXIX 93U and 94W). That this shape originated in pottery is testified both by the early Cypriot WPIV example of this form (Amiran 1969, 166) and by their technology. In her discussion of the technology involved in the manufacture of lentoid flasks, Amiran (ibid 163) shows how the use of the wheel was instrumental in the construction of the vessel. In early work it was suggested that the lentoid flask was an "Egyptian imitation of Aegean pottery" (IKG 17) but this conjecture is unfounded. As Furumark (Furumark 1972a, 32) observed, the lentoid flask has a specifically oriental origin, and given the many examples of this form in Palestine, and the early Cypriot example, it is perhaps best considered a Palestinian or Cypro-Palestinian form. Given its widespread distribution, and the variety of materials in which it occurred, it is unreasonable to too strongly associate this form with a specific function or cultural value. Rather it should be seen as the transference of a fashionable form to another material.

Pomegranate Vessels

The pomegranate vessel is identified by a rim fragment and the body of a vessel at Amarna (AR81 and BM 36282) and at Gurob by a rim fragment (GR1). While it is not confined to glass, this form does seem more common in this material than others. There is one example in

stone (FFSV Pl XXXIX no. 637) which was assigned on typological grounds to the 12th Dynasty. Such a suggestion probably represents an error, as this form seems to be more consistently associated with the New Kingdom. There is also a silver example of a pomegranate vessel from the tomb of Tutankhamun (Carter & Mace 1963 Pl LXXIII (A)). There are also several examples of the pomegranate vessel in faience (eg. BM 21918, BM 59398). The function of the vessels is unknown, but the selection of the pomegranate shape may have a symbolic significance. The pomegranate shape is found not only as vessels, but also as small amulets (eg. BM 1019-20). In symbolic terms, the pomegranate has been used as a symbol of fertility, due to the copious number of seeds it produces. It may be that the pomegranate vessel represents such a symbol. With respect to this it is worth noting that one example of the pomegranate vessel is from a double flask (Cairo J. 35186)(Glas. 76 no. 1). Interestingly this vessel from Darb Esbeida was found with ushabtis of Ramesses VI implying that it probably represents part of the grave goods from a burial. All the provenanced examples of this form in Egypt are from graves. Although speculative, it is tempting to see these vessels as cultic containers. The suggestion that they are ritual vessels gains support from Serabit el-Khadem (Simpson 1988) and Timna (Rothenberg 1988, 216), where pomegranate vessels are represented in the finds from the Hathor temples. It would seem highly

plausible that the pomegranate vessel represents a symbolic vessel, probably linked to an iconography of fertility.

Lotus Beakers

The redating of the lotus beaker (Ashmolean E.2451)(Glas. 49 no. 10) has been discussed above, and here the argument that it is coeval with the other glass on the site is accepted. This form is current in other materials, for instance an example in stone from Gurob (B&E Pl XXVIII) dated to the end of the 18th Dynasty. In addition there are several other examples listed by Petrie (FFSV nos. 813, 815-7). There are also two examples known in metal, one from Amarna and an unprovenanced New Kingdom example (Radwan 1983 405 and 406). It is also a form which occurs in faience (IKG PL XVII (8)). This would seem to support the argument for accepting the redating of this vessel.

The lotus beaker is a characteristically Egyptian product, and although originating in stone was imitated in other materials. It seems reasonable to accept that these examples in glass were used as drinking vessels. This would indicate that certain of the glass vessels did serve as functional items.

Kohl Tubes

Glass kohl tubes are represented at Amarna by one rim fragment, AR28 and at Gurob by three examples, Brussels E.623 (Glas. 145 no. 25), Ashmolean E.2578 (ibid 143 no. 18) and an example listed by Nolte (ibid 148 no. 45). Kohl tubes are known in several different materials, stone (FFSV no. 137, IKG Pl XVII nos. 21-2), in faience (IKG Pl XVII no. 43). The form of the glass kohl tubes is, however, derived from an architectural element, columns shaped like palm trees which probably originated in wood (Smith 1958, 236). Despite the various forms of these vessels in different materials, it seems certain that they functioned as containers for cosmetics. This is further supported by the find of applicators with the glass kohl tubes as in tomb 54 at Gurob (Loat 7) where a kohl tube was found with a haemetite applicator.

Bowls

Bowls have been predominantly identified from fragments, inferences derived from their morphology are therefore severely restricted. The problems in identifying the morphology of the bowls is further complicated by the prevalence of this form in other materials. The bowl was a simple and standardised form, therefore it is difficult to consider whether glass

bowls were imitative of or skeumorphs of other materials. Of interest, however, is the handled bowl from Gurob (Man. .728)(Glas. 74 no. 3) from the "Group of Ramesses II (beginning of reign)" which is exactly like an alabaster bowl in the same deposit (IKG Pl XVIII no. 25). Referring again to the King's Drinking Scene (Davies 1905a Pl 32), the king is drinking from a bowl. Such a function may have been filled by certain of the bowls. A number of alternative functions are of course possible. Furthermore, the small size of the smallest bowls eg. AR99, would indicate that not all the glass bowls were intended to be functional. Thus bowls potentially were used for a number of functions.

"Single Forms"

Of those forms which Nolte considers "Single Forms", only one appears to have a parallel. A fragment of a flaring neck jar, GR5, has a parallel in pottery represented at Gurob (Loat Pl II no.32). Other pieces, especially the fish vessel, have no direct parallel in other materials, although there are flat fish dishes and spoons in stone. It is a tempting theory to consider these vessels as "end of the day glass". That is , that these were pieces made by craftsmen with the remainder of the glass from producing other objects. Alternatively, it may simply be a reflection of the glass workers ability to invent or imitate other shapes.

It can be suggested then, that the vessel morphology of the glass vessels is essentially derived from other materials.

Colour

The second attribute to be investigated for its significance is the colour of the glass employed in the vessels. There are three areas of investigation as to the colours used. The first is that the background colours may be imitative of other materials, primarily the types of stone which were used to produce vessels. Alternatively, the choice of colours may simply be a function of the level of technical achievement of the glass manufacturers and/or the availability of the colourants used in the production of the glass. Finally it is possible that the colours, and in particular combinations of colours may have had some iconographical significance.

The range of background colours shared by Amarna and Gurob include; black, brown, green, light blue, and turquoise. In addition at Amarna is the use of clear, white, yellow and mosaic technique backgrounds. Significantly at Gurob white and yellow glass were available, as the decorative use of these colours proves. Therefore the choice of background colours was not determined by technological ability or the availability of colourants.

It is worth considering whether the colours employed were chosen because of their similarity to semi-precious stones and the types of stone used for vessels. With respect to this, the most obvious connection is that the majority of the backgrounds at both sites is dark blue, which may be imitative of lapis lazuli. There is no textual evidence from Egypt, but Mesopotamian texts show that glass was identified as "artificial stone" (Oppenheim et al 1970, 9). More specifically is a reference to "lapis lazuli from the kiln" (ibid 10) indicating that the dark blue glass was coloured with reference to lapis lazuli. Given the influence of lapis lazuli on the colour of the glass, it seems reasonable to accept that the light blue and turquoise glass was produced to imitate the colour of turquoise. It is worth noting, however, a Middle Assyrian ritual tablet which describes "one Iahannu bottle of artificial lapis lazuli for wine" (ibid 16). An important distinction is the use of the word "artificial", which implies that while the bottle was like lapis lazuli, it was not considered as lapis lazuli.

The blue colours were achieved by using either cobalt or copper (Kaczmarczyk & Hedges 1983, 235-7), which has implications for the choice of background colours. It could have been argued that the blues, if produced by copper, were simply the result of the wide availability of this material in the New Kingdom. There

have been several studies of the colourants used to reproduce the dark blue glasses with particular reference to the presence of Cobalt (Henderson 1990, 253-7), and it has been shown that for Amarna, the majority of the dark blue glass was coloured with cobalt. This would tend to reinforce the theory that the glass was produced deliberately to look like lapis lazuli, as cobalt, unlike copper, was principally used as a colourant and was not widely available.

That the colours employed were imitative of stones seems an acceptable suggestion, but it is important to stress that glass was seen as a distinct material. In certain pieces, eg AR101, an effort has been made to imitate the veining of stone, showing that certain vessels were produced as "alternative" stone vessels. The majority of the glass vessels, however, were decorated with trailed decoration, and it is impossible to believe that these were intended as imitative of stone vessels. Thus, the choice of colours was heavily influenced by the colours of stones, but the glass vessels themselves should not be seen as imitative of stone.

The technical ability to produce certain colours also does not seem to have been a primary consideration in the choice of colours used for decoration. This is indicated by the fact that again, while Amarna has produced a wider range of colours only the orange, pink and red decorative trails are not represented at Gurob.

Henderson (Henderson pers. comm.) considers that these colours, in a technical sense are all shades of red, and achieved by the same colourant probably cuprous oxide. There is red glass at Gurob, Tomb 6 contained strips of red glass for furniture inlays (B&E Pl XXIX), and so it may be suggested that the choice of decorative colours was not primarily influenced by technical considerations. Rather it appears that the choice of decorative colours was determined by the initial choice of the background colour. The primary consideration seems to be the desire to achieve a light on dark or dark on light contrast. This probably explains the ubiquitous nature of white and yellow as decorative colours given the prevalence of dark backgrounds. It would appear, then, that there is no great significance in the choice of decorative colours.

Decorative Motifs

Three approaches could be applied to the analysis of the decoration of the glass vessels. It would be desirable to consider decoration as a systematic zoning of the body. Unfortunately, when dealing with fragments such an approach is not really practicable. Following the approach above, the decorative motifs were considered as both skeumorphic attributes and examined for their potential symbolic significance.

The most common forms of decoration, festoon,

feather and flame seem to be determined primarily by the working properties of glass. The plasticity of the glass led to the dragging of the decorative trails into these characteristic forms. There are, however, forms which are not influenced primarily by the working methods, represented at Amarna and Gurob. The imitation of the veining of stone in glass is a consistent feature although representing only a small proportion of the glass vessels. A similar skeumorphic use of decoration is evidenced by AR31, where the panelling seems to be imitative of the flattened surfaces of metal vessels, for example on the strainer jug from Amarna (COA I 69 Fig.5). Finally, the scroll decoration of AF12 may be imitative of Aegean pottery motifs. The Aegean origin of the running spiral is attested by the prevalence of this motif on the LHIII pottery imported at this time. The spiral has a long tradition in the Aegean as illustrated by Petrie (Petrie 1930a Pl LXXX-LXXXI), whereas in Egypt it is relatively uncommon. The influences on decorative motifs from other materials are, though with a few exceptions, not great.

Similarly, there are only two motifs found on the glass under discussion which show any symbolic significance, cartouches and eye and sun decoration. The symbolism of the cartouche is relatively simple, in terms of this discussion, it links the glass vessel to royalty. Two fragments from Amarna have cartouches of Ahkenaten, AF50 and AF189. The presence of cartouches is

consistent with the evidence that the production of vessels was essentially a royal industry (see Chapter 6).

Finally, at Amarna are several fragments with "eye" decoration eg. AF45 and two examples of "sun" decoration (AF69 and AF70) Given the revolution in religion that occurred at Amarna with its concomitant effect on art, it would appear that these designs do have a symbolic significance. The Aten is described, and depicted as a disc and it seems reasonable to accept that these motifs are connected to the religious reforms. They may represent, either experimentation with novel imagery, or alternatively may have been specifically commissioned by the royal court. Given the intimate association of the innovative art at Amarna with the court, it is the latter suggestion which seems most plausible.

Conclusions

In considering the glass vessels, little attention has been paid to their use. Generally speaking, when considering ceramics there is a consensus that where they occur as imported items it was the contents that were traded not the pots. There are of course, exceptions to this rule, such as the Mycenaen kylix, which seems to have been traded as a luxury item. With glass vessels, this maxim need not necessarily hold true. Given the complex technology involved in the

manufacture of the vessels, and the necessity of obtaining a variety of colourants, it seems probable that the glass vessels were valued above their contents. It has been argued above, however, that this does not preclude a functional purpose for the vessels, and the evidence strongly suggests that many of the vessels were intended for use. While the connection of kohl tubes to cosmetics indicates one function for the vessels, it would appear that others were associated with drinking.

The Social Context Of The Glass Vessels At Gurob

In an effort to understand the social significance of glass vessels at Gurob with respect to their use and status value, an examination was made of the contexts from which they were recovered. Unfortunately two major problems with the evidence make the conclusions presented here highly interpretative. The most difficult problem is that of the lack of published evidence, particularly in Loat, with respect to all the associated material, however 'humble'. It was also necessary to concentrate primarily on the distribution of complete vessels and given the survival chances of glass, this obviously gives a bias towards 'closed' contexts such as tombs as against 'open' contexts such as settlement debris. It is inherent in archaeology, however, that one works with the evidence available and therefore the evidence from the 'closed' contexts of the tombs and 'housedeposits' will be examined in an effort to address the questions of the status and use of the glass vessels.

The Gurob Cemeteries

The tombs at Gurob provide a major source of information on the status of glass vessels at the site. Nolte (Glas. 138 no.11, 145 no.25, 148 no.45 and 49 no.10) gives the following grave numbers as containing

glass vessels, Graves 1, 36, 54, and 58. Unfortunately Loat's report (Loat 7) only gives associated material for one of these, Grave 54, and there is no information on the nature of the construction of these graves or the number and types of burials they contained. Brunton and Engelbach (B&E Pl. XIV-XVIII) do provide such information, but discovered only two tombs, numbers 5 and 34, that contained glass, giving a very small sample with which to work. There is a further problem, common throughout cultures with wealthy burials, that tomb looting has taken place both in antiquity and modern times, and in particular at Gurob all the chamber tombs have been robbed (ibid 10). Despite these intrinsic problems, the published evidence from Brunton and Engelbach's tomb registers (B&E Pl. XIV-XVIII) was used to assess the status of the glass vessels at Gurob. Two different approaches were employed in this study, first an analysis of the tomb architecture and second an examination of the goods found in the tombs.

Tomb Architecture

A broad division can be made in the burials at Gurob between the simple dug graves, which make up the vast majority of the 316 burials, and the elaborate shaft graves, most with more than one chamber. There are only 22 examples of the latter type of tomb, with both Tomb 5 and Tomb 34 belonging to this group. Such

Table 8.1 Ranking Of Shaft Tombs At Gurob

Rank	Tomb No.	Lengthwise Axis (m)
1	6	18.6
2	5	15.6
3	36	13.4
4	34	12.2
5	37	10.6
6	474	10.4
7	473	8.5
8	35	8.4
9	472	7.6
10=	475	7.3
10=	476A	7.3

elaborate burials because of the effort involved in their construction are indicative of the high social status of the burials they contain. In New Kingdom society, this effectively means individuals with connections to the state either directly as royalty by birth or marriage, or indirectly as officials of the bureaucracy. Moreover, when considering the social "value" of the glass vessels it is worth noting the relative sizes of the chamber tombs. Here the measurement used for comparative purposes is the maximum lengthwise axis of the tombs, based on the plans published by Brunton and Engelbach (B&E Pl.XIX-XX). Table 8.1 gives the resulting lengths in ranked order.

It is perhaps significant that both Tomb 5 and Tomb 34, represent particularly large examples of the chamber tombs (ranked 2nd and 4th respectively). Thus it would seem, based on the architecture of the tombs, that not only were glass vessels restricted to the upper class but may have been confined in distribution to only a small elite within this social strata.

Grave Goods

The second method employed in the evaluation of the status value of the glass vessels at Gurob was an examination of the grave goods included with the burials. A primary division was made in the material types represented in the tombs, with a simplistic division in to pottery, faience, metal (copper and its alloys), precious metal and "others". These groups were then subdivided in to broad types of artefact class, with vessels, shabtis, scarabs, sculpture, jewelry, tools and plaques taken as representative of the majority of the evidence and "others" to cover more atypical material. In terms of this study, the access to a wide range of material types was considered of greater importance in determining status than the sheer numbers of items represented. Furthermore, while it is difficult to create a hierarchy in status terms for different artefact classes, a broad distinction was drawn between objects which required either a considerable input of

specialist skill or time, such as vessels, and objects which were known to be mass produced such as scarabs. In order to make this examination feasible, in terms of the data base employed beads were excluded.

Several general considerations must be made concerning the distribution of the grave goods at Gurob (see Table 8.2 and Table 8.3). Firstly, 90 burials (30% of the total reported) contained no objects, and these must be taken as being those of the lowest strata of society represented in the burial record. It does not seem that this has been particularly biased by looting for, significantly all of the chamber tombs provided at least some artefactual evidence. The second observation is the widespread distribution of pottery, being present in a total of 183 graves (58% of the total represented). Furthermore, of those burials which contain only one class of material, those with only pottery constitute the single largest group, with 107 examples (34% of the total). The pottery artefacts included with the burials are primarily vessels, and it can be inferred that these vessels were included as containers for burial offerings, such as food or oil, rather than for their own value. As could reasonably have been anticipated, it appears that the inclusion of pottery in burials at Gurob is of no great significance in determining the status of the graves.

In terms of the frequency of the occurrence of materials, faience is the next most common, with 70

Table 8.2 Frequency Of Occurrence Of Various Material Types

Material Type	With Glass Vessels		Tombs	
	No.	%	No.	%
Pottery	2	100	183	58
Faience	1	50	70	22
Stone	2	100	51	16
Metal	-	-	11	3.5
Precious Metal	-	-	11	3.5
Other	2	100	32	10

examples (22% of the total). Primarily, however, faience is represented as scarabs in 57 burials (18% of the total), and there are only 4 examples (1.3% of the total) of the inclusion of vessels in faience. Given the complex nature of the manufacture of faience vessels, requiring specialist skill, it would seem probable that such vessels may be taken as representative of high status burials.

There are 51 examples (16% of the total) of burials which include artefacts manufactured in stone, with the single largest artefact class represented in this group that of the vessels, present in 24 burials (7.6% of the total). In estimating the significance of the stone vessels as social status markers, two points are worthy of consideration. In favour of a connection to high status burials is the fact that in 10 examples, stone

vessels occur in the shaft tombs discussed above. Contrary to this, however, is that in 7 burials, stone vessels are associated only with pottery. Thus it would seem that by themselves, stone vessels are of no great value in assessing the status of the tombs.

In terms of the relative incidence of both metal, and precious metal objects, both occur very infrequently in the tombs, with 11 tombs containing metal artefacts (3.5% of the total) and the same incidence of burials with precious metal artefacts. In both material types, jewelry and scarab mountings account for the majority of the objects. It is probable, given the value of metals in New Kingdom Egypt, and the potential for recycling the metals employed (copper/bronze, gold, silver and electrum) that metal objects are indicative of high status burials.

Based only on the occurrence of different material types, glass occurs in only 6 graves, other than as beads, it would seem that glass did have a high status at Gurob. Moreover, there are only 2 examples of glass vessels in Brunton and Engelbach's tombs, which would seem to stress the importance of glass vessels as markers of high status.

In considering the status of glass vessel, however, mere incidence is not a conclusive evaluation of their importance. It is rather the association of burial goods which may give a better indication of the status of the glass vessels. In terms of the availability of a wide

Table 8.3 Number Of Material Types Types As Represented
By Tombs In Brunton And Engelbach's Tomb Registers

No. Material Types	With Glass Vessels		All Contexts	
	No. Tombs	%Total	No. Tombs	%Total
0	-	-	90	29
1	-	-	142	45
2	-	-	51	16
3	1	50	19	6
4	1	50	10	3
5	-	-	4	1

range of different materials, the tombs were divided in to groups composed of the number and types of materials that were included (see Table 8.3).

Tomb 34 has four different types of material represented, pottery, faience, stone and "other". Significantly, a very small number of burials have four or more different materials represented, only 4.5% of the total burials, suggesting the high status of this tomb. In addition, included as grave goods in this tomb are a shallow faience tub (B&E Pl.XXVIII no.38) and an alabaster krateriskos, both of which, but primarily the former, are indicative of a high status tomb.

The glass vessel from Tomb 5 was found in association with pottery vessels (B&E Pl.XXXI), an alabaster fragment, probably from a krateriskos and a fragment from an alabaster canopic jar. Tombs with three

or more variables constitute only 10.5% of the total number of tombs, which would again indicate the high status of the burials. It is, of course, worth noting that neither of the classes of material associated with the glass in Tomb 5, have particular merit with regard to classifying the tombs as "high status". There is, however, overwhelming evidence that this tomb does represent a high status burial.

Tomb Location

The cemeteries at Gurob are apparently divided into groups based on the social position of their occupants. With respect to this it is significant that both the tombs in this study which included glass vessels are from the North West cemetery. As Thomas observed concerning this cemetery: "These had once been fine tombs and were clearly those of officials and important people. " (Thomas 1981, 21). The evidence discussed above suggests not only that glass vessels were of high status, but that they may have been restricted in distribution to the elite. This is supported by Tomb 5, for this burial was that of a royal prince "Pa-Ramesses" (B&E 19-24). Further support for a connection between the glass vessels and the court comes from Loat's Grave 54 (Loat 7) where a kohl tube was found in association with a haemetite applicator inscribed with the title "Royal Scribe Menkheper". Based on the evidence of the

tomb architecture, the social division of the cemeteries, and the goods associated with the glass vessels, it would seem that not only did glass have a high prestige value, but that it may be intimately associated with the royal court.

Grave goods could be included for two specific reasons either they represent specific items necessary for the funeral rites, or they represent personal possessions which the occupant wished to enjoy the use of in the afterlife. The inclusion of glass vessels in tombs falls in to the latter category, for there are no distinct forms which are specific to burials and their numbers are too restricted to presume a general function in funerary ritual. Thus glass vessels seem to have been included in burials as personal possessions, presumably of high status.

The Gurob 'House Deposits'

The other group of 'closed' contexts is Petrie's 'house deposits', the chronology of which has been discussed above (Chapter 6). There are seven such deposits identified here by the designations assigned to them by Petrie based on the periods he thought they represented. In addition Group 705F is published in Brunton and Engelbach (B&E Pl. LII) only in plate form, but presumably represents a further 'house deposit'.

The high status of the 'house deposits', in

general, is suggested by the wide range of materials they contained. In terms of comparisons with the distribution of material types in the tombs and the 'house deposits, their post-depositional histories must be considered. Unlike the tombs, the 'house deposits' have not been looted and thus may appear on initial examination, to represent an abundance of wealth. This 'wealth' is, of course, under represented in the tombs and, therefore it is not that the social status of the 'house deposits' is necessarily higher than that of the tombs. The range of materials in the 'house deposits', however, is still indicative of a high status for these contexts. Five of the 'housedeposits' contained 4 different material types, with the remaining 3 having 5 different materials. In terms of the range of materials represented in the burials, it is significant that only 4.5% of the tombs contain 4 or more material types. Five of the 'house deposits' contain glass vessels; "Group of Tutankhamun", "Group of Ramesses II (Beginning of Reign)", "Group with Trussed Fowls", "Group End of XVIIIth Dynasty" and "Group 705F". Three of these groups contain faience vessels and the "Group End of XVIIIth Dynasty" contains a metal vessel. It seems, then, that the occurrence of glass vessels in the 'house deposits' is consistent with their high status.

The nature of the objects contained in the 'house deposits' was summarised by Petrie as: "A large quantity of distinctly personal property, such as clothing, a

stool, a mirror, necklaces, kohl tubes and toilet vases" (IKG 16-19). The absence of bones led Petrie to the following interpretation; that they were "foreign burial customs"(ibid 16) with the body being disposed of in Egyptian fashion. Given that Petrie based his assertion of the presence of 'foreigners' on the quantities of Aegean pottery, it is hard to maintain such a view now that the widespread distribution of Late Helladic III pottery, and its imitations, in Egypt and the Levant is better documented. It is generally accepted that such pottery represents trade rather than the incursions of foreign populations. Moreover, while 'foreigners' may have been present at Gurob, particularly with respect to the presence of a harim, they seem to have been completely assimilated in to Egyptian society. The material evidence from the 'house deposits' is also typically Egyptian in character, and therefore it seems that the 'house deposits' represent an Egyptian practice. What this practice was, however remains enigmatic, Thomas (Thomas 1981, 13) suggests that they may represent "rubbish deposits", but this seems contrary both to Petrie's (IKG 16) assertion that the pits were dug through the floors of the houses and that the objects were burnt in the pits. Furthermore, many of the goods are both of relatively high status value and complete and this contradicts the idea that the 'house deposits' are rubbish where one would not expect to find whole vessels and other complete objects. The 'house

deposits' do suggest ritual activity given the association of a consistent series of articles, prestigious vessels, copper knives etc. and the associated burning which was deliberately smothered with pot sherds.

In Kemp's reappraisal of the site of Gurob he argues convincingly that the building, repeatedly termed the "temple", is in fact a harim-palace. His reinterpretation is based on the similarity in architectural plan to the "Palace of the King" at Malqatta (Kemp 1978a, 130), from the nature of the finds from the "temple", and from the Gurob papyri (ibid 131). Kemp interprets the buildings "as a palace where lived the queen and other senior royal ladies at the head of a household containing a large complement of female royal attendants and perhaps women carrying on industries" (ibid 132). This reinterpretation has implications for our understanding of the 'house deposits', as Petrie claimed that the pits containing the burnt deposits were dug through the floors of the houses which extended over the 'temple' (IKG 16). Given that the 'houses' are, in fact, subdivisions of the palace, then it is the case that the 'house deposits' are cut through the palace floor.

The first, obvious point, is the connection between the glass vessels and the palace. In terms of the theory that such vessels were restricted in distribution to an elite at Gurob, the association of the glass vessels

with the harim palace seems further to support this. Indeed, it seems reasonable to accept that, at Gurob, there seems to be a connection between the distribution of the glass vessels and royal contacts. Kemp, however, makes no attempt to explain how the 'house deposits' relate to the functions and activities of the palace. A tempting suggestion would be to consider them as a foundation deposits, but as observed these are unparalleled in other palaces. Moreover, the pits were dug through the floor suggesting activity post construction rather than a pre-building phase. It would seem, then, that the 'house deposits' do represent ritual activity, with the exact nature of this ritual unparalleled in Egypt.

There are two possible broad explanations for the nature of this ritual, either that it was a communal ritual, or alternatively that it was a personal ritual. Given the presence of a small temple on the site of the harim-palace (Kemp 1978a, 130-1), had the burnt deposits represented a communal ritual, it could have reasonably been expected that there would have been a concentration of these deposits in the vicinity of the shrine. Although Petrie provides no detailed evidence as to the distribution of the 'house deposits', it is reasonable to assume that they were dispersed through various houses, and thus were in effect in distinct rooms of the palace complex. Thus they do not seem to have been concentrated in the area of the shrine. That

the burnt deposits represent a private, or personal ritual would seem to be more in keeping with their dispersed nature. Combined with the nature of the artefacts in the 'house deposits' (cosmetic containers, tweezers, and other personal toilet items) it is reasonable to assume that the objects represent the possessions of the high status women of the harim-palace. That this ritual is unparalleled in Egypt may indicate the presence of high status women from other countries at the court, bringing with them 'foreign' rituals. Equally, it could be a personal ritual which was adopted at Gurob for reasons particular to the harim-palace complex. While the rite remains unparalleled, it remains enigmatic, but it seems to be a personal rite carried out by the ladies of the harim-palace which involved burying status objects after burning them in pits.

Finally, one fragment (GF14) is noted as coming "from a pit with ashes" (Cooney 1976 no. BM67028), and this could well be an indication that broken vessels were treated merely as rubbish, and stands as a warning against elaborate theories built only on the distribution of complete vessels!

Of the forms of glass vessels recognised at Gurob, the majority are from narrow necked vessels. It is highly probable that these vessels were containers for cosmetics and perfumed oils (the narrow neck would cut down evaporation loss). Accepting this interpretation,

it is also probably wisest to view the glass vessels as personal possessions. Certainly, the evidence from the graves, where they are very rare, precludes the idea that they may have a specific mortuary function.. Similarly, the goods contained in the 'house deposits', while occurring in an "official" building, the harim-palace, are still representative of personal possessions. There are no consistently associated ceremonial or cultic objects, such as specific figurines, for instance. Furthermore, the siting of the pits in distinct rooms, dispersed from the shrine in the palace, would also tend to suggest a personal ritual.

Therefore, it seems reasonable to assume that the glass vessels were personal possessions of high status, primarily serving as cosmetic containers. With respect to their distribution, it seems that they were restricted to an elite within the upper strata of society, and it is reasonable to surmise that this group can be linked to the harim-palace at the site.

The Social Context Of The Glass Vessels At Amarna

There are problems associated with the interpretation of the social status of glass vessels at Amarna. The long history of excavation at the site means there is considerable variation in the excavation strategies employed by different expeditions which sought to fulfill their contemporary objectives, for instance Carter, working with Petrie was concerned largely with unearthing sculpture (Petrie 1931, 142). In addition is the incomplete recording of the site in the published evidence, and, indeed, certain excavations, such as those of Newton (Newton 1924), were never fully published, even by the standards of the day. With respect to the discussion below, which is largely based on the "City of Akhenaten" publications, there is a specific problem in the consideration of glass vessels, for in COA III the report contains the descriptive term "fragment of variegated glass" (for example in the servant's quarter (COA III 82), with the authors not clarifying the use of this term. Here this term will be taken to mean a glass vessel fragment.

The history of occupation of the site also creates complications in evaluating the status of the glass vessels, and other objects from the site. The abandonment of the city of Akhetaten on the return of the court to Thebes, while useful in chronological terms, causes problems in interpreting the status of

deposits at Amarna. Newton's comment concerning house Q44.1, "the whole place having the appearance of being swept clean when the owner left" (Newton 1924, 290), illustrates the fact that the range of artefacts in the archaeological contexts at Amarna are not fully representative of those present during the buildings' occupation. Undoubtedly, it would have been the more prestigious objects that were removed on the abandonment of Amarna. Furthermore, post abandonment, the capital city of Akhenaten was robbed for stone to furnish Ramesside building projects, as testified for instance in the find of talalats of Amarna style at other, later sites, Athribis (Fairman 1960a) and Karnak (Saad & Manniche 1971) for example. Presuming that the buildings were still largely standing at the time of this quarrying, it is probable that most of any goods of value that had been left behind would have been looted from the site. In addition there is some degree of later contamination at the site, with Roman material in certain houses, e.g. House T34.3 described as "honeycombed with Roman burials" (COA II 66-67). As with most sites in Egypt the site has also suffered from the attention of looters, both ancient and modern. Finally, part of the site has now been disturbed by cultivation.

In addition to the occupation history of Akhetaten, the archaeological deposits of a city present interpretative problems which should be noted. Unlike

'closed' contexts, such as burials, where the deposits represent distinct activity phases, the 'open' contexts of a city may represent a wide range of depositional processes. At its purely physical level this may mean the admixture of adjoining contexts. At Amarna where contexts were primarily determined in terms of the architectural units, this has lead to imprecision in assigning objects to specific buildings in certain instances, eg. Clerks' Houses 58-65 (COA III 122). Moreover, different types of contexts have various post depositional histories, at a basic level, for example, houses would have been cleared of refuse during their occupation, leaving an apparently 'poor' context, while rubbish deposits would contain rich remains.

Physical Distribution

Despite these considerations, however, a number of approaches may be pursued in an effort to evaluate the status of glass vessels at Amarna. Before considering more specific information, it is necessary to establish that glass vessels are not uniformly distributed across the site in the general covering deposits. To this end the distribution of the glass vessels as reported in COA I-III was examined in terms of the site grid established by the Germans and followed by subsequent excavations. Figure 9.1 is a schematic diagram of this grid. On the ground each square is 200m in length, and the squares

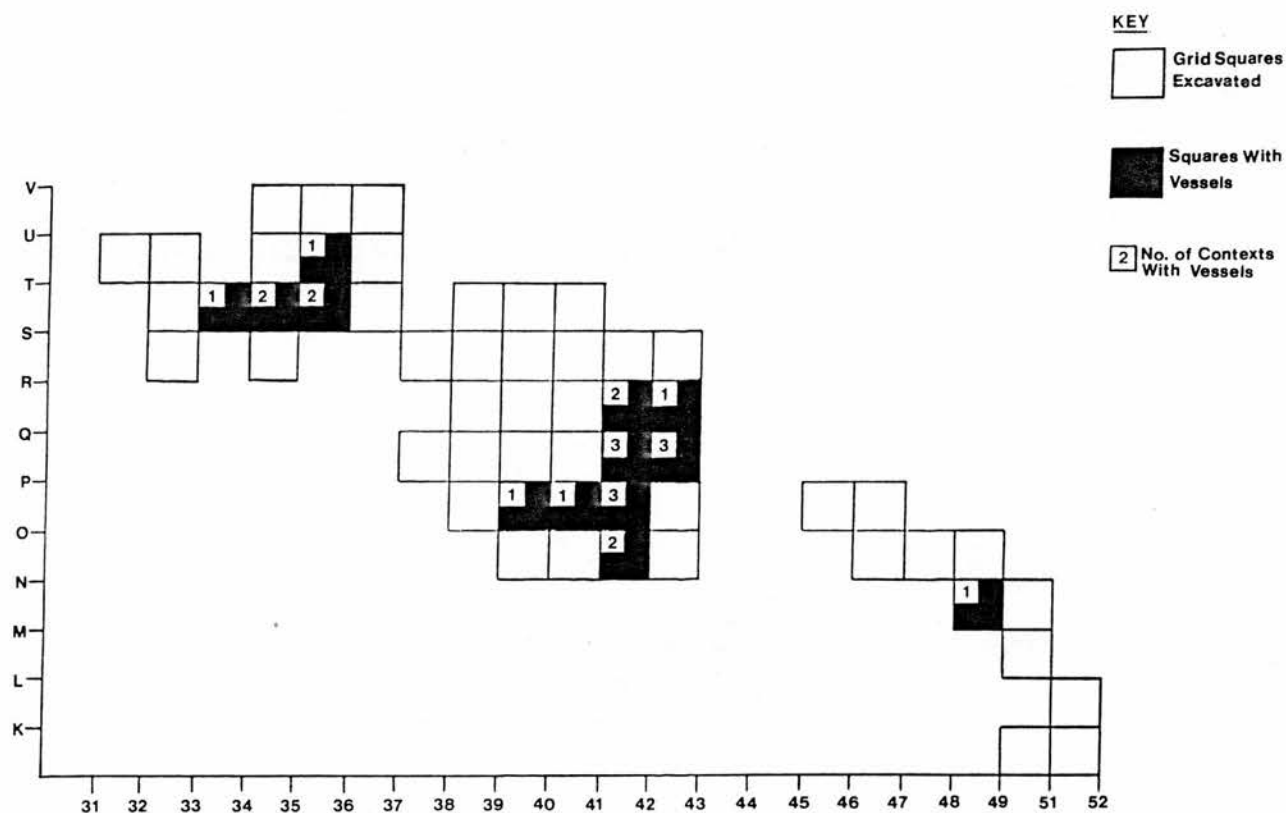


Figure 9:1 Schematic Representation Of The Distribution Of Vessels At Amarna.

are numbered along the North-South axis, and lettered on the East-West axis. Squares are designated by the top right corner in an alpha-numeric combination. This schematic diagram shows that glass vessels were primarily concentrated in two areas of the city, The Northern Suburbs and in the Central City in the vicinity of the palace complex and administrative areas. In addition, there is one context N49.20 which, because of its idiosyncratic nature as the only 'closed' context with glass vessels will be discussed separately below.

Furthermore, there is one instance of a vessel fragment in the Workmen's Village, in East Street 12 (COA I 72) which is not indicated on the diagram. As well as showing the simple incidence of the presence of glass vessels, the top left corner of each square on the diagram records the number of different contexts in each square which contained glass vessels. It appears that at this level there is a further apparent concentration in the Central City area around the palace and other 'official' buildings. In physical terms, then, glass vessels seem to have a restricted distribution, and it is possible that this distribution may be explained in terms of status.

Context Type

A further stage in the evaluation of the status of glass vessels at Amarna, is to examine the nature of the

contexts in which they occurred. Despite the subjective nature of the descriptions, the interpretations as to the type of context assigned by the excavators to the different buildings was examined. The descriptive terms used in COA I-III were divided in to 14 different categories, and here their incidence is presented in Table 9.1. The first observation is that in terms of simple frequency of occurrence, glass vessels are associated with private houses and royal contexts, with 66.7% of the contexts which have vessels belonging to these types. However, it is also important to consider the incidence of different context types. When this information is included, the incidence of glass vessels is considered in terms of their frequency of occurrence in a given context type. Significantly, the association of glass vessels with house contexts is shown, in fact, to be very weak, with the high number of examples being merely symptomatic of the preponderance of houses at Amarna (representing over half the total contexts). The highest rate of of association is with N49.20, representing a sealed pit, but this is not particularly useful as this is the only occurrence of this type of context at the site. More importantly, however is that the greatest rate of association is between official and royal contexts and the presence of glass vessels. This is of interest because it may imply a connection between the court and the distribution of glass vessels.

The relatively high incidence of glass vessels in

the Clerks' Houses appears to contradict the suggestion that glass vessels represented status objects. It is possible, however, that the presence of the glass vessels in Clerks' Houses 14,40 and 42 (COA III 122-4) is the result of the contamination of these contexts by others adjacent to them. In Woolley's preliminary report he states;

"...to the south of the rectangle formed by the palace, temple and government offices...there extended a large and densely populated quarter...occupied by artisans, sculptors' assistants, glass workers, faience makers and the like" (Woolley 1922, 64).

In addition, the rubbish dumps excavated by Petrie are reasonably close to the Clerks' Houses in the adjoining two squares, being located between R43.3 and R42.10 (COA III 142). Of all the recorded contexts, it would appear that these rubbish deposits contained the greatest quantity of glass fragments, Petrie states that there were "750 pieces from the rubbish mounds, 38 from the palace, and none from elsewhere" (TEA 15-6).

Furthermore, Petrie recorded the size of these rubbish dumps as approximately 180m by 135m (600 by 400 feet) (ibid). The potential for contamination of the Clerks' Houses is, then, considerable. Finally, the Clerks' Houses were not well preserved, indeed:

"Many of the houses are much destroyed, a fact which accounts for the objects from several being grouped together." (COA III 122) While it seems probable that

Table 9.1: Types Of Context Represented At Amarna

			(%)	(%)	
Type	No. Ves.	No. All	All (%)	Ves./Context	Vessels
Clerks	3	42	6.2	7.1	12.5
House	9	352	52.1	2.6	37.5
Workman's	1	39	5.8	2.6	4.2
Mags House	-	4	0.6	-	-
Mags Offic.	-	30	4.4	-	-
Chapel	-	23	3.4	-	-
Temple	-	48	7.1	-	-
Official	2	10	1.5	20.0	8.3
Royal	8	68	10.0	11.8	33.3
Shop	-	2	0.3	-	-
Workshop	-	3	0.5	-	-
General	-	24	3.5	-	-
Rubbish	-	3	0.5	-	-
Sealed Pit	1	1	0.1	100.0	4.2
No Record	-	22	3.3	-	-
Unknown	-	5	0.7	-	-
Total	24	676	100.0	-	100.0

the vessel fragments in the Clerks' Houses represent secondary deposition from either the rubbish dumps or the workshop area, the presence of a glass vessel in East Street 12 proves that glass vessels were not confined only to high status contexts. Unlike the Clerks' Houses, the Workmen's Village, because of its

isolation from the main city illustrates that glass vessels did reach the lower strata of society. The relatively low status of the inhabitants of the Workmen's Village is well established (Kemp 1987b), thus indicating that while glass vessels were primarily associated with high status contexts, they were not solely confined to this class.

The link between high status contexts, particularly royal contexts, is further strengthened when notice is taken of the number of fragments recovered is taken in to consideration. Although the evidence from COA III does not state figures, it is interesting to note that the term 'fragments' is reserved for use in the following contexts; The King's Estate (COA III 87-92), The Palace Magazines (COA III 46-49), The Bridge (COA III 56), The Police Quarters (COA III 132-5). Only the last two do not form part of the palace complex. The high number of fragments from Petrie's rubbish dumps has already been mentioned. It is worth observing that he believed that the artefacts from this context represented primarily the refuse from the palace (TEA 15-16). This, then, would seem to indicate that glass vessels were primarily associated with contexts at Amarna which the excavators designated as royal in nature.

Architectural Features

In an attempt to evaluate the status of the private houses which contained glass vessels, the 9 houses were examined in terms of their architecture. The houses which had glass vessels were, Q42.11 (COA III 116), Q42.30 (COA III 115), R43.1A (COA III 139), T34.1 (COA II 63-64)[18], T35.3 (COA II 40-41), T35.20 (COA II 47), T36.59 (COA II 52), T36.78 (COA II 52) and U36.34 (COA II 22).

Crocker (Crocker 1985) has carried out an examination of the architectural features of the houses and their potential as status indicators. He argued that alongside size, the following are particularly indicative of high status; possession of three or more columned rooms, the presence of a pond or well, a piered area in the compound and two doorways between the loggia and the hall (ibid 64). Table 9.2 lists the presence (+) or absence (-) of these features in the 9 houses in which glass vessels were found.

Crocker (ibid 54) makes the arbitrary decision with respect to house size that the largest 10% represent 'high status'. According to Crocker's data (ibid 55), the top 10% comprises houses with an area of greater than 300m². Significantly, most of the houses

[18] N.B. The actual context including the glass is in an outbuilding, T34.4 belonging to T34.1.

Table 9.2 Trait Analysis Of Houses With Glass Vessel

House No.	Size (m ²)	3+ Column	Pond/Well	Piers	2 Doors
Q42.11	100	-	-	-	-
Q42.30	105	n.d.	n.d.	+	n.d.
R43.1A	280	+	+	-	+
T34.1	354	+	-	+	+
T35.3	140	-	-	+	+
T35.20	168	-	-	+	+
T36.59	112	n.d.	n.d.	n.d.	n.d.
T36.78	120	-	-	-	-
U36.34	192	-	-	-	+

which contained vessels fall in the minimum range of Crocker's house areas. One house T34.1 falls within the upper 10% of the houses, in addition R43.1A lies just outside the lower limit of this group. Furthermore, both R43.1A and T34.1 have architectural features which may be taken as indicative of high status. In addition the excavators' comments regarding U36.34 as a "bigger well preserved, but gloomy house" (COA II 22) with a large estate, may mean that this house may have had a slightly higher status than the largely undifferentiated lower 60% of the houses. Another architectural feature which has been suggested as indicating high status is the presence of stone lintels (Crocker 1985, 52). There are stone lintels in T34.1, U36.34 and R43.1A which would further tend to support the suggestion that these houses

were of high status. Finally, inscriptional evidence indicates that T34.1 was the house of Hatiay, the Overseer of Works (COA II 63-64), a powerful position in the new capital city, thus confirming the high social position of at least one of the houses.

Considered in isolation the evidence from the houses does not obviously support the premise of a direct association between high status and glass vessels. 55% of the glass vessels are found in houses of 100-149m², which is very similar to the frequency of this house size (60% of the total) indicating that glass vessels were perhaps evenly spread through the different ranks within the private city houses. When taken in conjunction with the prevalence of glass vessels in royal and official contexts, however, it can be argued that the vessels do appear to have a relatively high status value. By adding the 3 houses taken to be 'high status' to the royal and official contexts, 54% of the contexts containing glass vessels may be considered as high status. Given the greater frequency of low status contexts at Amarna, this figure, based on the architectural evidence would seem to support the ascription of high status to the glass vessels.

Associated Artefacts

An examination of the other material types and

artefact classes associated by context with glass vessels was carried out and used to assess their status. Despite the inherent problems concerning the distribution of finds at Amarna, referred to above, the nature of the associated goods does tend to imply a relatively high status for glass vessels. The method employed here is essentially the same as that described in the previous chapter, however, at Amarna glass was treated as a distinct material type. Thus, it should be borne in mind that the presence of glass raises the total number of variables by context by one. Hence comparisons are primarily to be made between a specific number of variables in a context with glass vessels and its counterpart in all the contexts containing one less material type. (e.g. If dealing with a context with 4 variables which contains glass, the appropriate comparison is with contexts having 3 variables.)

Table 9.3 and Fig 9.2 present the number of variables for each specific context. Only one context where glass vessels are present has only 2 variables and this context, N49.20, deserves separate discussion in any case. If, following Crocker, one uses the top 10% of the site as representing high status the link between glass vessels and status is apparent. Ranking the contexts by the number of material types they contain, shows that high status is to be linked to the presence of 5 or more different material types. Contexts with glass vessels which have 5 or more material types

Figure 9:2 Number Of Material Types/Context At Amarna

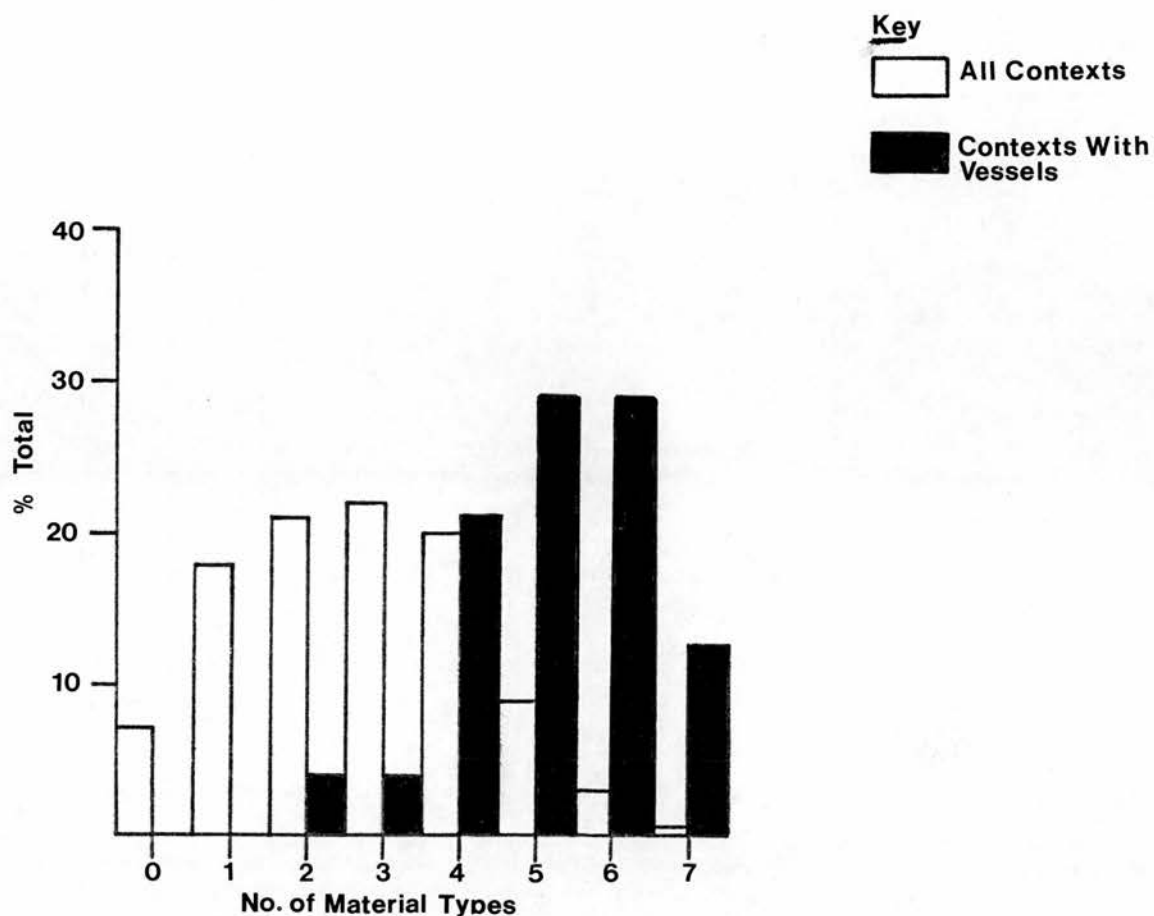


Table 9.3 No. Of Material Types By Context

With Glass Vessels			All Contexts	
No.Materials	No.Contexts	%Total	No.Contexts	%Total
0	-	-	44	6.7
1	-	-	120	18.3
2	1	4.2	136	20.8
3	1	4.2	142	21.7
4	5	20.8	129	19.7
5	7	29.2	58	8.9
6	7	29.2	22	3.4
7	3	12.5	3	0.4
Total	24	100	654	100

represented compose 71% of the total number of contexts with vessels. (Even allowing for a reduction of 1 variable, the percentage is still high at 42%). If it is accepted that access to a wide range of materials is indicative of high status, then the glass vessels do seem to represent high status objects.

Table 9.4 Frequency Of Occurrence Of Various Material Types

Material Type	With Glass Vessels		All Contexts	
	No.	%	No.	%
Pottery	24	100	574	88
Faience	23	96	373	57
Stone	19	79	308	47
Metal	15	62	245	38
Glass	24	100	92	14
Precious Metal	4	17	40	6
Other	12	50	148	23

Table 9.4 gives the frequency of occurrence for each material type. Not surprisingly, pottery is the most ubiquitous find on the site, with nearly every context which has artefacts also containing pottery vessels or small clay objects. As such it is not an indicator of high status. Similarly, faience has a widespread distribution at the site, with 57% of contexts containing this material. Faience, however is

principally represented by scarabs, small items of jewelry, tiles and decorative inlays. Faience vessels, however, have a more restricted distribution and may indicate high status. Such vessels are found in only 6.8% of the contexts at Amarna. Moreover, nearly one third of the instances of faience vessels (32.6%) occur in contexts which can be classed as royal and this would tend to indicate that they had a restricted and presumably high status. Interestingly, of the 24 contexts which contain glass vessels 7 (29% of the total) also contain faience vessels. This association may indicate that the glass vessels also had high status.

In considering the other materials, it is important to state at the outset that none of the other materials are uniformly associated with glass vessels.

Stone artefacts present the next greatest association being present in 79% of the contexts with glass vessels. This is significantly higher than the incidence of stone in all the contexts, but as stone occurs in nearly half of the total contexts this is not a particularly strong indicator of high status. One third of the incidence of stone with glass vessels is as stone vessels, but such vessels are remarkably common at Amarna occurring in 98 contexts. Furthermore, when the distribution of stone vessels at the site is examined, it becomes apparent that they are more common in the Workmen's Village than in royal contexts, which would

suggest that they are not good indicators of high status. Nine of the examples of contexts with glass vessels are associated with stone sculpture which is most frequently linked to royal contexts. (35 of the 79 incidence of stone sculpture are in royal contexts.) As all the contexts which contain both glass vessels and stone sculpture are classed as 'royal' or 'official', this may be more a reflection of the diverse nature of such contexts rather than inherently indicating a high status for glass vessels.

Metal is associated with glass vessels in 15 contexts (62% of the total with glass vessels) which, again, is higher than its rate of incidence overall, 38%. In every instance, with the exception of N49.20, the metal artefact(s) found with glass vessels represent tools. In terms of the discussion of status objects it is worth noting Kemp's observation that, "much of the debris in houses, above a certain, probably fairly modest, level must derive from the activity of servants" (Kemp 1978b, 137). It may well be that in the metal tools, it is the possessions or implements of such servants that is primarily represented. Of course, it could be argued that the ability to support a staff of servants is in itself an indication of relative status. Given that servants were a prerequisite of even middle status Egyptian households, this does not indicate that glass vessels need have had a particularly high status.

More significant perhaps, is the greater incidence

of glass vessels with precious metals; 17% of contexts with glass and 6% of all contexts. Of particular interest with respect to this is the association of glass vessel fragments with a gilded tube in the Police Quarters (COA III 132-5). Given the nature of this object, and its occurrence in an 'official' context, it seems reasonable to postulate that by association the glass vessels from this context do represent high status objects. Finally, ivory, presumably a high status material because of its rarity in Egypt, is found in 2 contexts with glass vessels and this may also indicate a relatively high status.

While the evidence of the material associated with glass vessels presents no conclusive argument that they had high status, it does seem to indicate that they did. Of particular importance is that glass vessels occur more frequently in contexts with a wide range of material and can also be shown to be associated frequently with artefacts which, because of their scarcity may be associated with high status. In addition, the interpretations of the excavators, and the evaluation of the architecture of the houses would tend to suggest a relatively high status value for glass vessels at Amarna.

Royal Association

In understanding the distribution of the glass

vessels, it is also worth considering the types of contexts where they are not found. Aside from one fragment in the Hat-Aten (COA III 92-100), glass vessels are absent from the temples and chapels which represent the religious sites at Amarna. The Hat-Aten has, furthermore been interpreted as the private temple of the King (ibid) and, given the association of glass vessels with royal contexts, it is perhaps better considered as representing a royal rather than sacred context. This absence has two implications concerning the uses of glass vessels at Amarna. First, it suggests that glass vessels were not used in ritual practices at Amarna. Second, it suggests that glass vessels were probably personal possessions for they primarily occur in contexts associated with the daily functioning of the city, either royal or domestic.

The association of glass vessels with royal contexts is further strengthened when an examination is made of the concentration of them in particular buildings. Although the exact number of fragments from glass vessels is not noted, there is evidence in the listing of "fragments" from the following contexts; in the Palace Complex, the Magazines, the Bridge and the S.E. Courts North, in the King's House and Royal Magazines in the King's Estate, and in the Police Barracks. In addition are the rubbish heaps "which contain thousands of fragments of glass, faience and pottery" (Peet 1921, 23) with these rubbish deposits

being linked to debris from the palace. With the exception of the Police Barracks all these contexts may be seen as part of the palace complex, and it seems there is a close connection between the glass vessels and the royal court. Two possible interpretations may be used to explain this association.

The most simple level is that glass vessels were, because of their high status, particularly valued at the court, and thus were 'monopolised' by it. With respect to this, the distribution of the manufacturing debris (see Chapter 6) does indicate that vessel production was essentially a royal monopoly, with the principal area of glass working adjacent to the palace complex.

A further suggestion takes in to account the prevalence of glass vessels with respect to specific areas of the palace complex, primarily in the King's Estate. Kemp (Kemp 1976) has argued from the architectural elements of the King's Estate, that the Window of Appearance, depicted in tomb paintings, was located in the North East corner of the King's House. Accepting this interpretation, the King's House then becomes the focus for the distribution of gifts by Akhenaten, and the concentration of glass vessels becomes explicable in terms of storage for later ceremonial distribution. Thus the glass vessels may have originated primarily within the palace workshops, and were then distributed as rewards during ceremonies carried out in the King's House. While not in itself

proof of high status, the royal distribution of what is essentially a small number of vessels, seems to confirm the high status of glass vessels at Amarna.

N49.20

One context, N49.20 (COA I 24), has so far been excluded from the discussion. This context is a pit which, alongside two glass vessels, contained 3 lead vessels which have collectively been interpreted as a wine set (Griffith 1926b). Such a wine set may further emphasise the association of glass vessels with objects of high status. Unfortunately, it is difficult to link this deposit to a particular building. In his preliminary report, Peet describes the find spot of the vessels:

"These bottles together with 3 vases of silver (sic) were found under the floor of a small room outside (author's emphasis), where they had perhaps been concealed for safety." (Peet 1921, 184). The final report, however, states that this pit was sealed by two plaster floors belonging to N49.20, and that at least part of N49.20 was demolished to create a street (COA I 24). This raises implications as to the nature of this deposit for, the pit must have been dug before the floors of N49.20 were laid. Given that the house was partially demolished to create a street, ie while Amarna was still occupied, the deposition of the vessels is

more likely to have occurred nearer the beginning of the occupation of the site. Given a deposition early in the occupation of Amarna, it seems misguided to consider them as buried in a "place of safety", for presumably they were buried in a period of the expansion of the city. Moreover, it is impossible not to view the idea of burying such goods for safety as a response to the abandonment of the site, and, given the stratigraphy there is no link between the deposit and the city's abandonment. Unfortunately, there is no direct evidence to link the pit to a specific building, and so it is difficult to determine what this deposit may represent. Interestingly, 6 bronze vessels were found buried in the temple floor (Frankfort 1929, 210), and this may imply a ritual element in the burial of metal vessels, perhaps as a foundation deposit? Such a suggestion is, of course, highly speculative.

Conclusions

It appears that at Amarna, glass appears to have a relatively restricted distribution, and is primarily concentrated in royal contexts. There is evidence to show, however, that it did percolate through to the lower strata of society, perhaps being distributed as royal gifts. Furthermore, its absence in religious contexts seems to imply that glass vessels primarily represent personal possessions of high status.

The Wider Distribution Of Glass Vessels In Egypt

The evidence from Amarna and Gurob discussed above suggests that glass vessels were high status personal possessions, probably produced in royal workshops. Certainly, at Amarna the distribution pattern for the vessels and the debris indicates an intimate connection with the palace. This chapter seeks to examine the wider distribution of the vessels within Egypt to assess whether the evidence from other sites supports this interpretation. The method employed was a survey of the published evidence concerning a sample of Egyptian sites.

Choice Of Sample

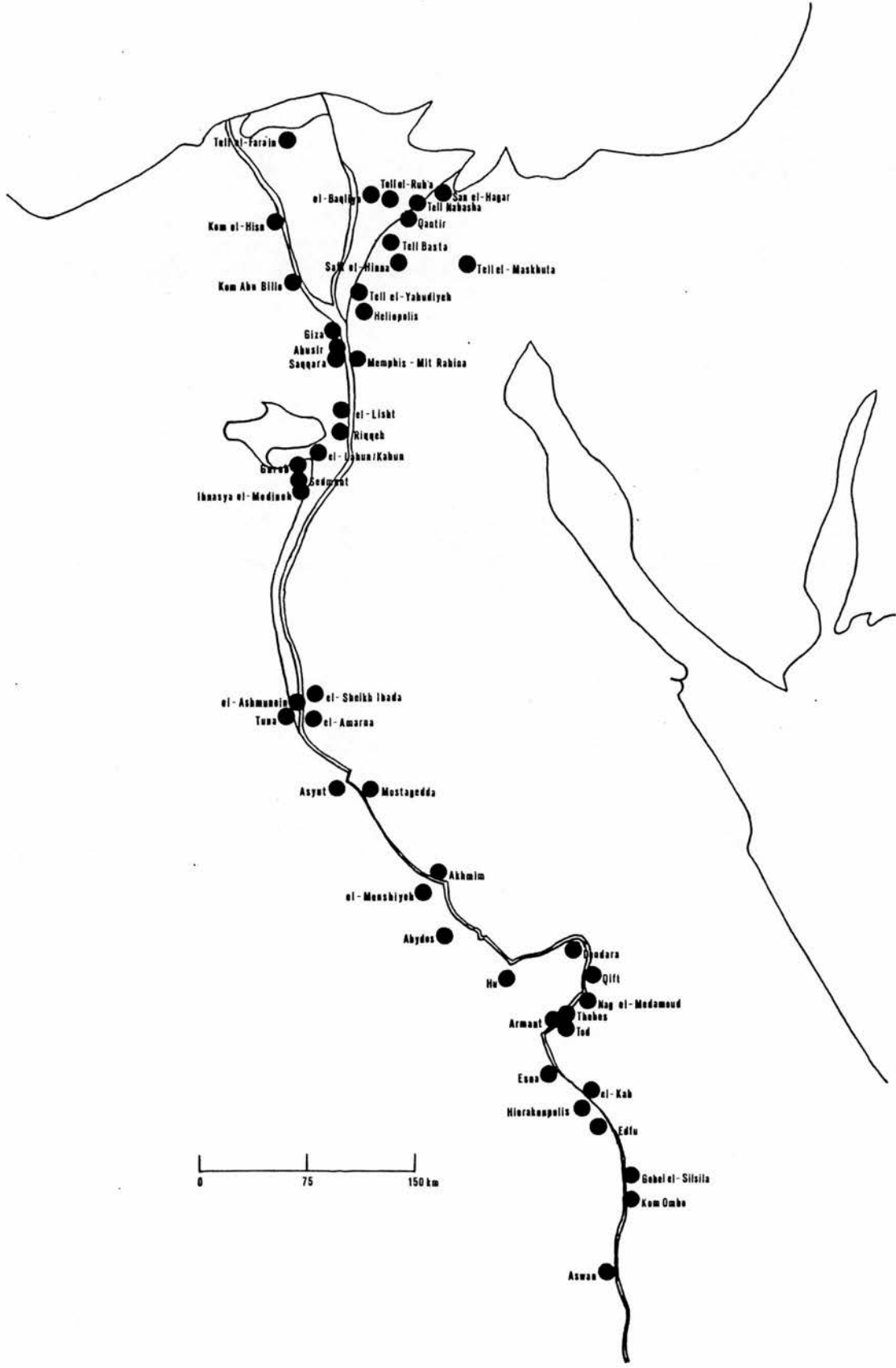
Given the vast body of published information on excavated sites in Egypt, it was impractical to carry out a literature survey of every Egyptian site with New Kingdom remains, and so a sample was selected. This sample was based on three main sources and comprised:

- 1) All sites listed by Baines and Malek (1980, 43) which were listed as having Dynasty 18-20 remains.
- 2) All sites listed by Nolte (Glas.) as producing definitely provenanced vessels.
- 3) All sites with fragments represented in the collection of the British Museum, whether definitely provenanced or merely attributed.

Table 10:1 Survey Of Sites And Presence Of Vessels

<u>Site Name</u>	<u>Status</u>
Abusir	Contexted
El-Ashmunein	Contexted
El-Lahun	Contexted
El-Lisht	Contexted
Giza	Contexted
Kahun	Contexted
Riqqeh	Contexted
Sedment	Contexted
Saqqara	Contexted
Thebes	Contexted
Abydos	Attributed
Armant	Attributed
Asyut	Attributed
Ihnasya el-Medineh	Attributed
Menshiyeh	Attributed
Mostagedda	Attributed
Tell Nabasha	Attributed
Aswan	None
Dendara	None
El-Baqliya	None
El-Kab	None
El-Sheikh Ibada	None
Esna	None
Gebel es-Silsila	None
Heliopolis	None
Hierakonpolis	None
Hu	None
Kom el-Hisn	None
Memphis-Mit Rahina	None
Qantir	None
Qift	None
Saft el-Hinna	None
Tell Basta	None
Tell el Rub'a & Tell Timai	None
Tell el-Fara'in	None
Tell el- Maskhuta	None
Tell el-Yahudiyeh	None
Tod	None
Akhmim	No Data
Edfu	No Data
Kom Abu Billo	No Data
Kom Ombo	No Data
Nag el-Medamud	No Data
San el-Hagar	No Data
Tuna	No Data

Figure 10:1 Location Map Of Sites Included In Survey
(Egypt)



This resulted in a sample comprising 45 sites (see Table 10:1 and Fig 10:1). For the purposes of this chapter Amarna and Gurob are excluded from the survey.

In addition to the inherent bias in Egyptology to over represent burial archaeology and large monumental buildings, this sample also suffers from further bias. Firstly, the choice of sources means that it greatly over represents major settlement sites at the expense of the smaller settlements within Egypt. More importantly, it is based on out of date sources particularly with reference to any work published in the last decade. In an effort to compensate for this the author surveyed the preliminary reports covering this period of British work published in JEA. It is interesting to note that in this period , major work was being conducted at Saqqara (Martin 1982-3, 1986-8), Memphis (JEA 1984-89) and Amarna (ARI-V, Kemp 1978-83), all major sites with previous excavation.

Given that two of the sources employed were supposedly representative of sites with vessels, and the over representation of major city sites, the likely bias of the sample should over stress the relative frequency of the occurrence of vessels.

At the outset of this literature survey the following, optimistic, criteria were set to define the bibliography to be consulted to satisfy the inclusion of a site. For every site all the final excavation reports had to be read, and where no full publication was

available, all the preliminary reports concerning a site were to be included. Where it was suggested that glass vessels were present at a site, it was proposed that all reports preliminary and final, were to be consulted. A bibliography, based on these criteria was compiled from the three sources listed above (Baines & Malek 1980, Glas., and Cooney 1976), and supplemented with references from Porter and Moss.

Within the framework of this thesis, however, this survey suffered from two major limitations, time and the availability of the literature. Due to unforeseen circumstances [19], it was necessary to obtain many of the publications via the inter-library loan system [20], and this imposed severe financial and logistical limitations on this survey. Thus the original criteria were not met in every case and ^{SEVEN} sites had to be excluded because of the lack of data; Akhmim, Edfu, Kom Abu Billo, Kom Ombo, Nag el-Medamud, San el-Hagar and Tuna.

[19] The major reference collection of Egyptological literature in Scotland, housed in the National Museums of Scotland's library, was unavailable for consultation due to building work.

[20] The author is extremely grateful to all the library staff at Edinburgh University for their efforts in obtaining so many titles so promptly.

The Presence Status Of The Vessels

The published evidence for Egyptian sites is, in general, at least as poor as for Amarna and Gurob. The same problems noted above, the incomplete recording, the bias towards burials and 'important' monumental buildings are, indeed, worse for many of the sites included in the sample. As a result it was not always clear whether vessels were present at a site. The following three terms were used to describe the presence of a vessel at a site; contexted, attributed and none.

Contexted means that there is specific reference within the excavation report to a particular location or type of context which produced one or more glass vessels, or fragments of such.

Attributed covers three situations where there is an element of doubt as to whether vessels were present. It includes both sites from which vessels have been recovered but are essentially unprovenanced, and sites from which there are glass vessel fragments which may be of New Kingdom date, but with an attendant uncertainty as to their identification. The term is also used to cover sites which have material provenanced by the British Museum catalogue, presumably from the original acquisition notes, but for which there is no reference within the excavation report. In every case these

attributions are discussed more fully, and their validity questioned. It is interesting to note, in passing, how many of the vessels listed by Nolte have no accurate provenance, being either completely unprovenanced or attributed. Generally this attribution is either to a site known to have produced glass vessels, a popular example being, for instance, the Grave of Amenophis II (see for example Glas. 125 no.18), or to a vague context (usually a burial) within a well known site, for instance to "a grave in Luxor" (eg. Glas. 133 no.41). This is not a failing on Nolte's part but rather, as became obvious to the author, a problem endemic in the published evidence, and in the codification of provenances by museums based on the sketchy records of late 19th and early 20th century excavators.

Before considering the general distribution pattern of the vessels within Egypt, it is worth reviewing the evidence of those sites from which vessels are said to have been recovered.

Sites With Contexted Vessels

A total of ten sites were classed as "contexted"; Abusir, El-Ashmunein, El-Lahun, El-Lisht, Giza, Kahun, Riqqeh, Saqqara, Sedment and Thebes.

Abusir

The site of Abusir is part of the Memphite necropolis and comprises both the earlier pyramid complex and a series of private graves, including New Kingdom burials. One grave, Grave 3 contained a glass vessel (Bonnet 1928, 64). Found in association with it were, a bronze vessel, a string of beads and a bronze ring of Amenophis III.

El-Ashmunein

El-Ashmunein is a town site in Middle Egypt with extensive New Kingdom remains, including the Rammesside Thoth temple complex, with occupation continuing at the site into the Late Period. There are two vessels from this site. One is contexted to a New Kingdom house in Trench II, found in association with pottery, a poker and a scarab (Roeder 1959, 209). The second vessel has no specific context, coming from the area to the south of the Middle Kingdom temple (ibid 330). Little is known about the use of this area but its main occupation appears to have been in the period Amenophis II-Ramesses II (ibid 42).

El-Lahun

Part of the Faiyum pyramid group, el-Lahun also

includes a New Kingdom cemetery with, in addition, the nearby cemetery of Kom el-Iswid. There are two references to glass vessels at el-Lahun, one of which is almost certainly Roman (Petrie et al 1923 Tomb Register no. 119). The other, a black, white and yellow glass vase (ibid no. 616) is dated to the 22nd Dynasty and so also falls out with the span of this consideration. In the Kom el-Iswid tombs, however, Petrie reported "some decorated glass" (ibid 35) of "the usual variegated variety" (ibid 36). There are two tombs at Kom el-Iswid, both elaborate D18 tombs, with contexted vessels; KI2 and KI4 (see Tomb Register). In addition, another similar tomb KI3 has "dark blue glass with white inlay", potentially representing another vessel.

El-Lisht

Primarily famous for the pyramids of Amenemhat I and Senwosret I, the site of el-Lisht has also produced remains of a settlement surrounding the pyramids, dating from the Late Middle Kingdom and occupied into the Third Intermediate. Unfortunately, the original reports (Lythgoe 1907, 1908, Mace 1908, 1921) are very incomplete, but fuller publication of the range of material has been made by Hayes (Hayes 1958, 410). The evidence recovered includes a range of material consistent with glass, and faience, production and includes; charcoal, crucibles, saggars, faience cores

(sic), rectangular plaques of faience used as rubbers, faience beads ready for firing, lumps, slag, glass vessel cores (sic) and two rod like ingots of turquoise blue. With respect to the dating of the site, Keller, who undertook a re-evaluation of the material, observed, "the glass workshop that had been set up in the village houses at Lisht had no strong chronological association" (Keller 1983, 24). On typological grounds, Keller is predisposed to date this material post Amarna, but concludes that "since conclusive archaeological evidence on this point is lacking, the question cannot be resolved at this point" (ibid 28). Thus while the site of the glassworks is probably to be dated to the Later New Kingdom, its relationship to the surrounding houses is unclear. It is extremely unfortunate that el-Lisht is so little understood, for it offers immense potential concerning glass and faience production in the New Kingdom.

Giza

Giza is most famous for the pyramid group, but as with other parts of the Memphite necropolis, it also includes burials of other dates. At Giza one vessel is contexted to a New Kingdom grave.

[21](over/)

Kahun

Situated in the Faiyum, near the Middle Kingdom walled town of Kahun were burials of all periods. Petrie (KGH 38) recovered a glass vessel from one tomb alongside bodies wrapped in palm stalk matting. The absence of coffins caused Cooney to remark that this implied a "modest" (BM entry 1738) burial. The burial also contained 2 scarabs of Tuthmosis IV, late 18th Dynasty blue painted pottery, 2 vases, a stirrup jar and a wooden shabti of the 19th Dynasty. The final use of this tomb, then, must date to the 19th Dynasty.

Riqqeh

The site of Riqqeh is a cemetery, located near the Medum pyramid with graves of all periods. There are two vessels reported from the site. One is from cemetery B (cemetery B no.14) but is assigned to no specific burial. This vessel, a blue glass "kohl pot", seems on typological grounds, to belong to Nolte's "early" group of vessels, with production of this type ceasing with the end of the reign of Tuthmosis IV. It seems probable that this vessel lies out with the span of the later

[21] Unfortunately the author was unable to obtain the published report- but it is here included as "contexted" due to the precision of Nolte's reference.

18-20th Dynasties under discussion here. The other example is well contexted, coming from the Tomb of Apiy (Brunton 1915 Tomb 201-02, 10-11), an elaborate shaft tomb of a prince of Medum. Given the title employed by Apiy, "Keeper of the fields of the Aten" (ibid 27), it seems reasonable to assign the original construction of the tomb to the Amarna period. Later multiple burials in the tomb, and plundering, however, mean that while this date is probable, it is impossible to state with certainty.

Saqqara

Saqqara, part of the Memphite Necropolis, is one of the main cemetery sites in Egypt. In the New Kingdom there are two principle concentrations of tombs at the site; in the vicinity of the Teti pyramid complex, and in the area to the South of the Causeway of Wenis. Dated principally to the period Tutankhamun-Ramesses II, these tombs represent some of the finest examples of private tombs in the New Kingdom.

There are several examples of vessels represented at the site of Saqqara. These include two examples in the Cairo Museum collection which are from the area around the step pyramid, but which have never been published with their associated finds (Glas. 93,105). There are also several examples attributed to the site, but in the absence of any contextual information, they

will be excluded from the discussion. Finally, there are three examples which have been published, again all from the area around the step pyramid. One vessel was found by Lepsius in the loose sand (Glas. 106), and had presumably been looted from a tomb. The second is listed as "from a path between the graves of the Old kingdom near the pyramid of Teti" (Glas. 137). Finally, one example is known from an identified tomb, Tomb No. 25 (Frith & Gunn 1926, 74). This grave contained two burials and a range of grave goods including alabaster vessels and small faience objects (ibid). Taken in its entirety, the evidence suggests that at least five burials at Saqqara contained glass vessels. Given the quality of the tombs, it seems reasonable to suggest that the individuals buried held high status in life. While these tombs may be placed in the period of the later 18-19th Dyn., closer dating without further information is impossible.

Sedment

Sedment consists of a cemetery with burials from the Middle to New Kingdom periods, including shaft grave tombs, one of which (no. 2010) produced "scraps of a multi-coloured vase" (Brunton 1924, 32). dated to the late 19th Dynasty by the excavator the other contents of the tomb included; 5 pottery coffins, "Aegean" stirrup jars, a stela fragment a faience bowl, kohl tube and

rhyton. While the last internments definitely date to the 19th Dynasty, as testified particularly by the clay coffins, the presence of a plaque with the inscription "Royal Scribe and General Haremhab" acts as a caution to automatically assigning the vessel to the 19th Dynasty. In addition Brunton (1930, 8) notes two "glass" vessels from the cemetery. While it is possible that the kohl pot illustrated (ibid Pl XX no. 10) is made of glass, it seems, given the morphology more likely to be faience. This is further reinforced, as if the vessel is glass then it would belong to the early period of glass vessel production, with such vessels apparently restricted to royal contexts. Moreover, the decayed condition further obscures the nature of this vessel. The other vessel is similarly decayed (ibid 8, Pl. XX no. 22). This example is a blue glass vessel in many fragments, from which only the neck could be reconstructed. This vessel represents either a flask or an amphoriskos. Again, however there is an element of uncertainty as to whether this vessel is glass, although less so in this instance. This grave (Group 1910) was much plundered and contained at least one hold-over, a jasper vessel (ibid 27), dating, at latest, to the Hyksos period. If the vessel(s) are indeed, glass then on the available evidence they could fall at any point in the New Kingdom, but are probably to be placed earlier rather than later.

Thebes - Necropolis

Thebes the capital city of the 18th Dynasty is a highly complex site, with settlement, several large temple complexes and extensive cemeteries, including the royal burials of the Valley of The Kings and the Valley of the Queens. Unfortunately for this study, the sheer scale of excavation and reporting of Thebes makes it impossible to carry out a comprehensive survey of every context. With respect to the Theban Necropolis, Nolte's corpus provides a reasonable indication of the distribution of vessels within the tombs. These tombs

Table 10:2 Burials At Thebes Listed By Nolte

Name	Status	Location
Tuthmosis III	King	Valley Of Kings
3 Princesses	Princesses	Wadi Qubbanet el-Qirud
Maiherpi	King's Fan Bearer	Valley Of Kings
Amenophis II	King	Valley Of Kings
Tuthmosis IV	King	Valley Of Kings
Kha	Chief Great Place	Valley Of Kings
Tiy	Queen	Valley Of Kings
Yuya & Tuya	Parents of King	Valley Of Kings
Tutankhamun	King	Valley Of Kings
Nes Chons	Queen	Deir el-Bahri
Patoui	Unknown	Qurneh
Mahu	Unknown	Qurneh

are listed in Table 10:2.

There are a number of observations to make concerning the distribution of the vessels in the tombs. First, the royal tombs received more attention, both in their excavation and in their subsequent publication, which may account for the paucity of instances of vessels from private tombs. Second, there are a number of vessels attributed only to "tombs at Thebes", and these may represent vessels in private graves. However, without a major review of the evidence, this is impossible to determine. Finally, the tombs at Thebes have been subject to extensive looting, both ancient and modern, and it is unrealistic to suggest that what has survived is representative of the grave goods at the time of burial.

These caveats stated, however, it seems peculiar that in the two sources employed here specific to glass (Glas., Cooney 1976), that there should be no example of a vessel contexted to a private tomb. Moreover, significantly only two examples of contexted vessels are from tombs belonging to individuals without direct royal lineage, the tombs of Maiherpi and Kha. Both these men held prestigious positions at the court; Maiherpi's title was "Fan Bearer of the King" (PM I(2) 36) while Kha's was "Chief in the Great Place" (PM I (1) 8). The presence of vessels in such contexts would tend to confirm the connection between vessels and the court.

A further two named tombs contained vessels, that

of Patoui (Glas. 151) and that of Mahu (ibid). Both these graves are located at Qurneh, but, unfortunately no further information was available to the author concerning the status of these tombs. In the report of Petrie's work at Qurneh, he noted;

" In another grave was a black limestone kohl pot and pieces of pyrites and blue glass" (Petrie & Walker 1909 12). As it is at least as likely that this refers to inlays, jewelry or other small objects this should not be taken as representing the presence of vessels.

While the contexted examples are confined to royal, and associated, burials, given the deficiencies of the evidence, it would seem foolhardy to discount the possibility that vessels were also present in private tombs. For, in addition to the above examples, many vessels are attributed to Thebes, and while of little archaeological significance, there is a high probability that many of such pieces originated in the Theban cemeteries.

Thebes City

Thebes is one of the three sites to have produced evidence for the production of glass and glass vessels. There are two areas which may be associated with glass working, the South Village and the Malqatta palace. The glass working debris was not fully published at the time, nor was much of the material deposited in the

Metropolitan Museum (which sponsored the excavation). Keller (1983), has published a review of the evidence in the collection of the Metropolitan Museum, described as a limited number of rods, test trails and glass waste (ibid 20). Taken in conjunction with the reported find of glass slag and crucibles, it seems a reasonable certainty that vessels were produced at the site.

Although situated two kilometers from the palace , the South Village was dependant on it, consisting of "the workshops and the residences of the craftsmen who worked on the palace" (ibid). The find of glass debris within the Malqatta palace itself, further confirms royal control of glass production and vessel manufacture.

The site of Malqatta is a ceremonial complex, consisting of a large artificial lake, close to the principal palace, and the Malqatta palace, which appears to have been a temporary structure. Kemp (1989, 216) succinctly describes the main features of this temporary palace, and shows how it was intimately involved with the celebration of the Sed-festivals of Amenophis III. Seen in this way, the presence of a glass production centre in the palace implies that at Thebes, vessel production and distribution were not only palace centred, but may have been linked specifically to the distribution of gifts at the Sed-festival. Such a situation may also pertain at Amarna. Given the close links between Malqatta and Amarna, both chronologically

and in the presence of Amenophis IV/Ahkenaten's court, it seems the pattern observed at Amarna was already established by the end of the reign of Amenophis III.

Finally, there is a cryptic reference to "some fragments of inlaid glass" from the magazines in the Ramesseum (Quibell 1898), but there is considerable uncertainty as to the nature of these pieces.

Attributed Sites

In addition to the sites with contexted examples of vessels there are a further seven sites which may have produced vessels and are hence classed as attributed". They are, Abydos, Armant, Asyut, Ihnasya el-Medineh, El-Menshiyeh, Mostagedda and Tell Nabasha. In each case it is necessary to establish the basis of the attribution, and to decide whether they are suitable for inclusion in this discussion.

Abydos

In the New Kingdom, the site of Abydos primarily represents private burials and temple complexes, amongst which of particular importance are the D19th royal cenotaph temples. There are no vessels reported from the temples, but there are two examples attributed to burials, although in both cases no grave number is provided. The first has been published (Amélineau 1885),

while the second, in the Cairo museum, was donated by Petrie, who stated that it came from a burial (Glas. 118), but never published it. In the absence of other evidence, these examples serve to confirm the presence of vessels in private burials. Unfortunately, little more can be stated with confidence.

Armant

The town site of Armant has produced two fragments of glass, potentially representing New Kingdom vessels: G32, a fragment of multi-coloured glass with a floral pattern (possibly dating to the 19th Dynasty and G33 a fragment of glass with a geometric pattern (Mond & Myers 1940, 124). This material is open to question on two grounds. First it is inherently probable, given their decoration that these fragments represent objects other than vessels. Furthermore, both pieces are from an undated context, Armant Town X, the loose covering deposit over the site. For the purposes of this study such a context is of no archaeological value, hence the site of Armant will be excluded from the discussion.

Asyut

One fragment (no. 432) in the British Museum collection is attributed by Cooney to Asyut. He states that it was "probable that this fragment was found in a

burial ". (Cooney 1976, 49). Such a vague statement as to the original context, and the relative paucity of New Kingdom tombs, would seem to make it inherently unreliable to consider this valid data.

Ihnasya el-Medineh

Two vessels in the British Museum collection are attributed to Ihnasya el-Medineh, BM 1741 and BM 1771 (ibid 143, 150). This attribution seems more reliable, given the fact that 1741 was presented by Petrie as originating in his excavations at the site. Unfortunately, Petrie makes only one mention of glass vessels, and from his description of them as "decorated with zig-zag lines of paint" (38), it is almost certain that he was not referring to the above pieces, but rather to glass post-dating the New Kingdom. Cooney raises the obvious suggestion that the British Museum fragments were found in burials, and this seems reasonable. Given the features of the site it seems likely that these fragments are from the wealthy burials dating to the 18-19th dynasties rather than to the later simple reburials, with bodies wrapped in reed matting described by Naville (Naville 1894, 12). Despite reservations about this evidence, the site of Ihnasya el-Medineh will be included in the discussion.

El-Menshiyeh

Several museums, including the British Museum, have vessels attributed to the site of el-Menshiyeh. Such is the quantity of the material that it has been widely accepted that el-Menshiyeh was the site of a glass workshop, generally assigned to a 20th Dynasty date (Hayes 1959, 403). Indeed el-Menshiyeh, alongside el-Lisht was used by Nolte to define the production centre for her Workshop 5 (Glas. 121). As Keller has pointed out however, the original attribution of this material to the site by Newberry, was based on hearsay evidence (Keller 1983, 20 note 4) *Furthermore*, she provides three convincing arguments against the designation of the site as a production centre, also casting doubt on whether the site did, in fact, produce evidence of vessels. First, she observes that there is no reference in Newberry's field notes specifically to the recovery of glass from the site. Second, there are no examples of material donated by Newberry which can be said with certainty to originate from the site, for example BM 1736 has only the ascription "probably looted from the site." Finally the prevalence of virtually complete vessels within the glass assemblage would tend to suggest that they were recovered from tombs rather than a settlement site. It is Keller's belief that Newberry was misled by the purveyors of this material so that the looting of a cemetery could continue

unhindered, and in light of the other evidence this seems to be likely. Given these objections, and that, in any case the material is uncontexted, it seems wisest to discount the evidence from el-Menshiyeh as highly unreliable.

Mostagedda

The cemetery site of Mostagedda is represented by one fragment in the British Museum, BM 1773. This fragment is supposedly from a tomb and was said to have been produced in the Amarna workshop. In the excavation report Brunton does mention finds of glass at Mostagedda, for example the presence of a glass coffin inlay in tomb 5301. It seems peculiar, then, that he should make no mention of any vessel. Moreover, this tomb (5301) dates to the 19th Dynasty implying that glass objects were reaching the site post Amarna. This would seem to question the certainty as to the identification of the fragment with either or both of Mostagedda and Amarna. While it is perfectly plausible that this fragment did come from a tomb at Mostagedda, given the uncertainties, it seems wisest to exclude it from the current discussion.

Tell Nabasha

Even the catalogue notes for BM 1759, attributed to

Tell Nabasha make it clear how vague the provenance of this vessel is, stating only that it was "found in the Delta by the E.E.F.". Therefore, while confirming that vessels were present in the Delta, this vessel has little else to make it worthy of comment.

Summary

From the original sample of 45 sites 12 have produced evidence concerning the provenances of vessels. The evidence from these twelve sites was used to examine the distribution of the vessels in three main areas; their geographical, chronological and social distribution. In particular, the following discussion is concerned with whether, as indicated for Amarna and Gurob, the vessels were primarily personal possessions of high status. In addition, the evidence will be used to examine the suggestion that the distribution of vessels was centred on the palace, and the possible mechanisms involved in the circulation of the vessels.

Before considering the distribution of the vessels in greater depth, it is worth passing comment on the restricted number of reported finds. There is a total of only 32 examples with contextual information. While this may in itself be indicative of the social nature of vessels as high status objects, restricted circulation of a particular artefact does not by itself imply high status. Furthermore, the limited number of contexts

employed in this study, means that generalised comments must be open to question because of the limited data. However given the relative scarcity of core glass vessels, both provenanced and unprovenanced, it does seem reasonable to assume that the evidence is representative.

Geographical Distribution

The twelve sites which have produced vessels appear to form regional groups, if proximity of location is taken as the defining criterion. These groups are listed in Table 10:3. Before considering the implications of this regional patterning it is important to establish whether these do represent distinct groups, but the identification of such groups itself depends on the interpretation to be advanced.

Regional groups may represent a number of different phenomena, but here only three will be considered.

- 1) Distribution from a workshop located in the area.
- 2) Distribution based on a particular social institution.
- 3) Apparent grouping caused by excavation bias and preservation conditions.

To deal with the final point first, it is, once more, worth stating the inadequate recording of many sites. However, the limited number of vessels held in museum collections and the limited number of sites to

Table 10:3 Regional Grouping Of Sites

Regional Group	Sites
Amarna	Amarna, el-Ashmunein
Faiyum	el-Lisht, Gurob, Ihnasya
el-Medineh, Kahun, Riqqeh, Sedment	
Memphite	Abusir, el-Lisht, Giza, Saqqara
Theban	Abydos, Thebes

which they are attributed, suggests that this is not the principal reason for their apparent distribution. In general, bias in excavation may reasonably be discounted with respect to this discussion. Conditions of preservation, however, may have a significant impact with regard to the apparent absence of vessels in the Delta. A number of reasons may explain this absence; the relatively poor preservation conditions, the difficulty of excavation on wet sites, the erosion and burying of sites by the Nile, and the preference of excavators for the easily accessible and rich burials of the known cemeteries. Moreover, the example of a fragment "found in the Delta" (op cit), does confirm their presence. With respect to the Delta, then, it is uncertain whether the relative absence of vessels is a function of the archaeology of the region or whether it represents a genuine regional distribution.

Chronology

An important consideration with respect to the evidence for regional groupings based on proximity, is the chronological distribution of the vessels. Given the limited number of contexts it seems reasonable to presume that distribution is based on local workshops (as in the case of Amarna). If this is the case, then the material may be expected to fall within a closely defined period of production. Table 10:4 lists the dates for the contexts under discussion.

With respect to the dating of the vessels, typology is, with the exception of a few specific cases, a poor indicator (see Chapter 6). While the dating of vessels is far more secure when based on associated material, this is unfortunately unavailable in many cases. It is surprising how many of the contexts are dated to D18, a point which will receive further attention below.

Given the deficiencies of the evidence, the following discussion does not start from the assumption that all the glass vessels from a given area were all contemporary and produced at a particular workshop site. Such an approach, given the volume of trade, internal and external, and the ease of transport on the Nile, would appear simplistic, to say the least. Rather, this examination is to test the possibility that this apparent grouping represents the clustering of vessels around workshop sites, with the vessels staying largely

within the locality.

Table 10:4 The Date Of Contexts By Regional Group

Regional Group	Site	Date Range
Amarna	Amarna	Akhenaten
	el-Ashmunein	D18-19
Faiyum	Riqqeh	Early D18
	Riqqeh	Akhenaten
	el-Lahun	D18
	Kahun	D18-19
	Ihnasya el-Medineh	D18-19
	Sedment	D18-19
	Gurob	D19
Memphis	Saqqara	Amenophis III
	Saqqara	D18-19
Thebes	Theban Necropolis	D18
	Malqatta Palace	Amenophis III
	Theban Necropolis	D21

Amarna Group

That the vessels from Amarna represent the products of a single workshop has been discussed in detail above. Given the proximity of el-Ashmunein it seems possible

that the vessels found there were manufactured at Amarna. Nolte (Glas. 100), linked these vessels to Amarna, but on chronological grounds the associated material is less specific, only indicating a D18-19 range. Typologically these vessels do not represent any of the "distinctive" Amarna types, and so could have been produced at any point in this period. There is, however, no evidence to invalidate the suggestion that the vessels from el-Ashmunein were produced at Amarna.

Faiyum Group

With the exception of one vessel from Riqqeh which although uncontexted can confidently be ascribed to an early D18 date on typological grounds (see below for a wider description of this "early" group), the remainder all fall within the later 18-19 Dyn. Within this time span, however, there is a range of dates. At Riqqeh, the vessel from the tomb of Apiy may reasonably be assigned to the Amarna period, and the Kom el-Iswid tombs are definitely D18. The material from Gurob (as discussed above), Kahun and Sedment, however must all date to the 19th Dyn. (Although, as will be discussed further below it is possible that this material may represent hold overs.) In the absence of any evidence of a glass workshop in the Faiyum, and in the chronological spread of the material, it is unrealistic to consider that the glass vessels were the product of a local workshop.

Rather, the Faiyum testifies to the internal circulation of vessels at a distance from production centres possibly el-Lisht which is the nearest production site. (Although in typological terms the el-Lisht vessels seem to represent a distinct group from those in the Faiyum.)

Memphite Group

It is equally possible that el-Lisht may have been the source for the Memphite Group. Accepting the conventional D20 date for el-Lisht, however, implies that both the vessel from Abusir, dated to Amenophis III by association, and the Saqqara examples dating to D18-19, cannot have been produced there. Typologically, too, the el-Lisht vessels are characteristically "heavier" and the decoration less well executed (Keller 1983, 38), than the examples from the Memphite necropolis. It seems inherently unlikely that the distribution of vessels within the Memphite group represents local production over a short time span.

Theban Group

There are three distinct chronological groups of vessels at Thebes. An early group with distinctive forms found in the early D18 tombs; a later D18 group represented by Malqatta and certain of the later D18 tombs; and a late group represented by the examples from

the grave of Nes Chons. The "early" and "late" groups will be discussed more fully shortly, but here it is the later D18 that will be considered. It seems probable that the vessels in the tombs of Kha, Tiye and Yuya and Tuya were produced in the Malqatta workshop. The examples from Tutankhamun's tomb, however, are more liable to have been produced at Amarna, or at another (as yet unknown) site, given that the Malqatta workshop ceased production on the transfer of glass production to Amarna. While the concentration of glass at Thebes is, obviously, partly a reflection of the presence of a glass workshop, this does not fully explain the distribution in either chronological or social terms.

It seems, then, that the apparent regional grouping of sites fails to account for the distribution of glass vessels as dependant on the presence of a workshop within a region. Moreover, the absence of any clear typological features which may be associated with any particular region, seems to invalidate the premise of regional production centres supplying a defined hinterland. More surprising is the apparent concentration of vessels in D18 contexts, and the paucity of securely dated D19 examples.

Broader Chronological Issues

Table 10:5 lists the number of contexts of known date from the sites surveyed here (excluding Amarna and

Gurob). There are no contexts which unequivocally date to the 19th Dyn., although there are four which may; tombs at Ihnasya el-Medineh, Kahun and Sedment, and a house at el-Ashmunein. The dating of the el-Ashmunein example has been discussed above, and it seems probable that it dates to the Amarna period. As there is no information on the associated material for the Ihnasya el-Medineh burials, this assigned date is really just an indicator that they are of later New Kingdom date, and therefore has no specific value.

The dating of the Kahun tombs to D19 rests on the presence of a wooden shabti, with the remainder of the material implying a D18 date. The occupants of the tomb were not buried in coffins but rather simply wrapped in palm matting. The poverty of these burials contrasts sharply with the presence of the high quality of the grave goods, including foreign imports. It seems probable, that the burials in matting represent the re-use of this tomb, and given their apparent poverty, the wooden shabti may be linked with the final use of the tomb. The other grave goods, including 2 scarabs (Tuthmosis IV and Amenophis II) and blue painted pottery typical of the later D18 (KGH 43) seem far more likely to have been associated with an earlier burial of D18 date. Interestingly Nolte (Glas. 108), assigns this vessel to her Workshop 3, dating to the Amarna period. It seems reasonable to presume that the Kahun vessel dates to D18 rather than to D19.

Table 10:5 Number Of Dated Contexts [22]

<u>Period</u>	<u>No. Of Contexts</u>
Early D18	7
Later D18	8
D18-19	4
D21	1

The burial from Sedment does appear securely dated to D19, but also definitely contains hold-overs, notably the plaque with the inscription "Royal Scribe and General Haremhab"(Brunton 1924, 32), which must date to the reign of Tutankhamun. Given such a hold over the vessel cannot confidently be dated to D19. Finally, while the Gurob "house deposits" must date to D19 (see discussion above Chapter 6), they too contain significant numbers of hold overs, for instance a vase of Amenophis III. The absence of any contextual evidence for D19 vessels, calls into question whether vessels were actually produced in this period. Certainly, no production centre similar to Malqatta or Amarna is known.

Moreover, the broad typological overlap in the vessels from Amarna and Gurob discussed above also has implications. Although certain types continue throughout

[22] Exclusive of Amarna and Gurob.

vessel production, it is possible to make a division between an "early", "middle" and "late" group within the vessels, covering respectively early D18, later D18-19, and D21; certain types are confined to these periods. The early group for example contains kohl pots, and other forms directly imitative of stone vessels. This also extends to their decoration, with the use of gold leaf around the rim, for instance. This group of vessels is also securely provenanced to early D18 tombs, and dated to the same period by cartouches on certain examples. Likewise the "late" group has distinct types, with a prevalence of simple forms both in morphology and decoration, in particular the popularity of the beaker form, as represented in the tomb of Nes Chons. The "middle" group however, cannot be separated into distinct phases as argued above. With respect to the absence of D19 contexts, this might at first be taken to imply that they are of a uniform, probably later D18 date. There are, though, reasons to conclude that while a major change occurred in the nature of vessel production, glass and vessels continued to be produced in D19.

That glass itself continued to be produced in D19 is not open to question, with finds of beads and other small objects, for example a glass socket with a cartouche of Ramesses II (Ashmolean 1965.185). Similarly, the continuation of faience production would also have required an input of raw glass. Moreover,

there is evidence from outside the Nile valley, in the form of a fragment from Timna, that conclusively proves that vessels were produced in D19. This fragment, Timna no.22b (Rothenberg 1988, 216), a small body fragment from a pomegranate vessel, has the lower part of an impressed double cartouche bearing the name of Ramesses II. Thus vessel production must have continued in D19. It would then seem unreasonable to automatically assume that vessels in the D19 contexts at Gurob and Sedment were hold overs.

Judging by the overall distribution of the vessels, however, D19 appears to have witnessed a massive contraction in the number of vessels produced. An explanation for this may be sought in the social context in which vessels were used and in their 'function' (social and ideological) within the late New Kingdom.

The Social Distribution Of The Vessels

The distribution of the vessels at Amarna and Gurob suggests that they were high status personal possessions. Moreover, the evidence concerning glass production at Amarna, and the concentration of vessels in the area of the royal estate, suggests an intimate connection with the court. It is against this social background that the apparent changes in the distribution of vessels in D19 must be considered. First, however, it is important to consider the social context of the

vessels included in this survey.

Table 10:6 Types Of Contexts Represented With Vessels

<u>Context Type</u>	<u>Number</u>
House	1
Tomb	25
Workshop	2

The nature of the contexts containing vessels (exclusive of Amarna and Gurob) is listed in Table 10:6. It is immediately apparent that the overwhelming majority of contexts represented are burials. Although, as mentioned above in the discussion of the Amarna and Gurob evidence there are reasons to suggest that burials inherently provide a biased record (the nature of "closed" contexts, and the concentration of archaeological work on tombs), this does support certain points made in earlier chapters. The inclusion of vessels as burial goods reflects their status as personal possessions, rather than as ritual objects. Moreover, the absence of vessels from temple and ceremonial contexts would seem to confirm that they were not inherently religious objects in Egypt. Certainly, there is no indication in the evidence employed here which suggests that the distribution of vessels at Amarna, where they seem to be personal possessions, is particularly unrepresentative. (The vexed question of

their inclusion in the "house deposits" at Gurob, however, still remains a strange anomaly.)

It was hoped to make an examination of the associated material for those contexts which contained vessels, as was done for Amarna and Gurob above. The inconsistencies in the recording, and the general lack of information concerning the associated objects meant that this was not practical. Therefore, an estimation of the status of the vessels must, by necessity, rest on inference. With respect to this, it is worth noting that in only one case is there any reason to believe that the vessel originated in anything other than a wealthy context. At Kahun, the burial has been described by Cooney as "modest", due to the lack of coffins, the bodies being merely wrapped in matting. As noted above though, it is extremely likely that these burials are to be associated with the re-use of the tomb. None of the grave goods published by Petrie (KGH 32) however, indicate a particularly wealthy tomb, although given the limited description of the tomb and its contents it is difficult to establish the social status of the tomb. Furthermore, while there has been a great deal of excavation in the Theban Necropolis, of the contexted examples, most are from royal tombs, indicating the restricted availability of the vessels. While little may be asserted on such poor contextual evidence, it does seem that glass vessels had a high status value.

The Status Of Vessel Production

The evidence for vessel production at Amarna indicates that it was largely, if not totally, a royal monopoly. Of the other two known workshop sites, Malqatta is, as will be described below, almost identical to Amarna. El-Lisht, however, does not seem to indicate royal production, for a number of reasons which may be summarised as the complete absence of any royal material either in terms of architecture or artefacts (Keller 1983, 21). Unfortunately, given that the glass workshop received only cursory investigation, little is known about it, moreover, the site is undated further complicating any interpretation. While it is generally agreed that it represents a D20 date, it may be, as Keller (1983 38) has indicated, that it represents a non-royal facet of an earlier glass industry. Until further work clarifies our understanding of the glass workshop at el-Lisht, the changes which seem to occur post-Amarna will be difficult to interpret with any certainty. For the purposes of the argument advanced here concerning these changes, the conventional dating of el-Lisht will be accepted. It thus indicates that by D20 glass vessel production was probably not solely a royal monopoly.

The situation in D18 however, both in the early and later groups does support the interpretation of vessel production as a royal monopoly. While no production

centre is known for the early D18, the contexts of this date in which vessels occur are almost exclusively royal or court burials. In the later D18, specifically in the period of Amenophis III-Tutankhamun, the evidence from Malqatta and Amarna, where the workshops are situated within the palace argues unequivocally for royal control of vessel production.

The similarities between the Malqatta palace and the Royal Estate at Amarna are such that the social organisation of the glass vessel industry may be presumed to be identical. To re-state the principal similarities in the layout and function of these complexes; both consist of areas of public display, with attached magazines and a "Window of Appearance", and both were intimately associated with the Sed-festival. Significantly there is a concentration of both glass working debris and vessel fragments in these areas at Malqatta and Amarna. Given this it seems probable that the distribution of vessels at Malqatta and Amarna is in some way connected to this festival.

Kemp has discussed the nature and role of the Sed-festival during the reigns of Amenophis III and Akhenaten (Kemp 1989, 213ff, 286). The main features of this festival were a banquet held by the king, ceremonial procession and the giving of gifts by the King. A contemporary description from the tomb of Kheruef describes the Sed-festival of Amenophis III:

"The glorious appearance of the king at the great

double doors in his palace, 'The House of Rejoicing'; ushering in the officials, the king's friends, the chamberlain, the men of the gateway, the king's acquaintances, the crew of the barge, the castellan, and the king's dignitaries. Rewards were given out in the form of 'Gold of Praise', and ducks and fish of gold, and they received ribbons of green linen, each person being made to stand according to his rank. They were fed as part of the king's breakfast: bread, beer, oxen and fowl." (Kemp 1989, 215)

The Sed-festival was a celebration of the renewal of the life of the king, and was one of, if not the most, important court events. Amenophis III, while changing the festival, did observe the traditional rule that it should take place in his 30th regnal year, with a second festival occurring four years later. Akhenaten, with his rejection of traditional religion however, celebrated 2 Sed-festivals in his 17 year reign. The ceremonial sites for these festivals were respectively the Malqatta palace and the Hat-Aten (part of the Royal Estate) at Amarna. Given the concentration of both finished vessels and glass workshops at these sites, it seems reasonable to conclude that production of vessels was primarily for distribution at the Sed-festival. While such a suggestion is difficult to prove without the assistance of textual evidence (which is itself irrelevant in the absence of an undisputed word for glass), the highly restricted distribution of vessels in

the period of Amenophis III - Akhenaten does not contradict this. It seems probable then, that the majority of glass vessels in the later D18 were distributed via the Sed-festivals of Amenophis III and Akhenaten.

Accepting this suggestion, there are three possible explanations for the apparent contraction in the scale of vessel production, and their more restricted distribution in D19.

The first explanation depends on an assumption that, in the New Kingdom, vessels were produced only for distribution at the Sed-festival. Kitchen has noted that "after Amenophis III (and leaving aside the 'non canonical' celebration of Akhenaten) probably no other pharaoh reigned long enough to celebrate a jubilee until Ramesses II" (Kitchen 1982, 178). Thus, the absence of vessels in D19 may be explained by the fact that the Sed-festival was not celebrated in this period.

There are a number of objections to such an interpretation. The first is that it is necessary to assume that vessels were produced only for the Sed-festival. While there are strong arguments for linking the production of vessels to the Sed-festival, as argued above glass production does not appear to have been episodic, with glass produced continuously in this period for a wide range of objects. Moreover, the necessary inputs into glass production and the skills involved would suggest continuous, if not extensive

production of glass and vessels at Amarna itself. This explanation also presumes that glass and vessel production at Amarna and Malqatta were typical for the New Kingdom. The glass workshop at el-Lisht, suggests that this is not necessarily the case. If, as seems likely, el-Lisht is to be dated post Amarna, then it shows that in later periods, glass vessels were produced in contexts with no connection to the Sed-festival. It may also be suggested that there is no connection between the "early" group and the celebration of the jubilee, given the very restricted number of contexts in which they occur, which do not include the sites of the jubilees of earlier kings. Furthermore, given the novelty and rarity of vessels prior to Amenophis III, it seems inconceivable to suggest that they were distributed en masse at Sed-festivals in this period. Thus it appears that the association of vessels with this festival at Malqatta and Amarna may be in some way atypical.

Certainly, in terms of the scale of vessel production, and indeed vitreous production in general, the Malqatta and Amarna workshops vastly exceeded other periods. It thus may be profitable to consider this period (Amenophis III - Akhenaten) as representing a massive expansion of the glass industry, under direct royal patronage, which subsequently reverted to smaller scale production. There is evidence to support such a suggestion, from the history and social developments

that occurred at this time. The artistic and intellectual 'revolution' which accompanied this period is too well known to require comment. Kemp (1989, 217) has suggested that the elaboration of the Sed-festival under Amenophis III, and its subsequent employment by Akhenaten, are to be linked to the growth of a charismatic monarchy. It is probable that, as with many absolute rulers, one way of pacifying the population was the distribution of largesse. Seen in this way glass vessels, along with other exotic goods, represent the attempt to legitimise and consolidate the modified role of the King. In such a scheme, the expansion of the glass industry becomes explicable in terms of the ideological system of the palace. Indeed, the requirement to produce art distinctly related to the king, may have provided a major impetus to the 'revolution' at Amarna.

The contraction in the scale of vessel production in the following period may then be explained in two possible ways. It is possible to see the scale of vessel production during the period Amenophis III -Akhenaten, merely as an aberration, and the return to a traditional pattern of production for court consumption. Alternatively, it may be that the down grading in the scale of vessel production, which had become iconographically linked with the reign of the "Heretic", was prompted by ideological considerations. Both are possible, and in either case it must be presumed that

court patronage was instrumental in determining the scale of production.

Within the context of royal patronage, there are broader issues to which reference must be made. The failure of the kings between Akhenaten and Ramesses II to celebrate the Sed-festival is an important indication of the turmoil that enveloped the court after the Amarna period. In addition, the period saw not only political and religious upheaval internally, but also the massive disruption of Egypt's external contacts. The 'causes' of the generalised collapse of the complex LB 'civilisations' are an area open to investigation, and certainly many factors have been identified by different authors. It is not the author's intention to digress into the relative merits of these 'causes' [23]. Without question though, this period saw, amongst other things, a deteriorating climate (Butzer 1976, 33), massive population movements (Sandars 1985), the disruption of the metal trade in general, and the tin trade in particular, and the collapse of political authority in several areas, particularly in the Aegean and in the Hittite Empire. Such conditions may have required the

[23] The author like Tainter (1988) believes that complex societies are vulnerable to collapse, precisely because of their complex nature, and that the 'causes' listed here are actually triggers or symptoms of the collapse of LB society.

court to transfer resources from the production of luxury goods to more mundane activities. This is not to suggest that individual craftsmen were diverted from, for example, glass working to the manufacture of weapons, but rather that trade via the palace became concerned more with obtaining necessities rather than luxuries. Both because of the essentially non-utilitarian nature of vessels, and because of a possible iconographic association with Akhenaten, the scaling down of vessel production probably appeared a favoured option, in a time of economic difficulty.

Conclusion

Thus, the distribution of vessels is to be understood in terms of the ideology of the court and the underlying economic factors. In the later D18 vessels appear to have been employed to legitimise and enhance the position of an increasingly charismatic monarchy, with distribution of a large number of vessels at festivals. the following Dynasty saw a massive contraction in the scale of production, and a reversion to a highly restricted distribution, largely confined directly to the court.

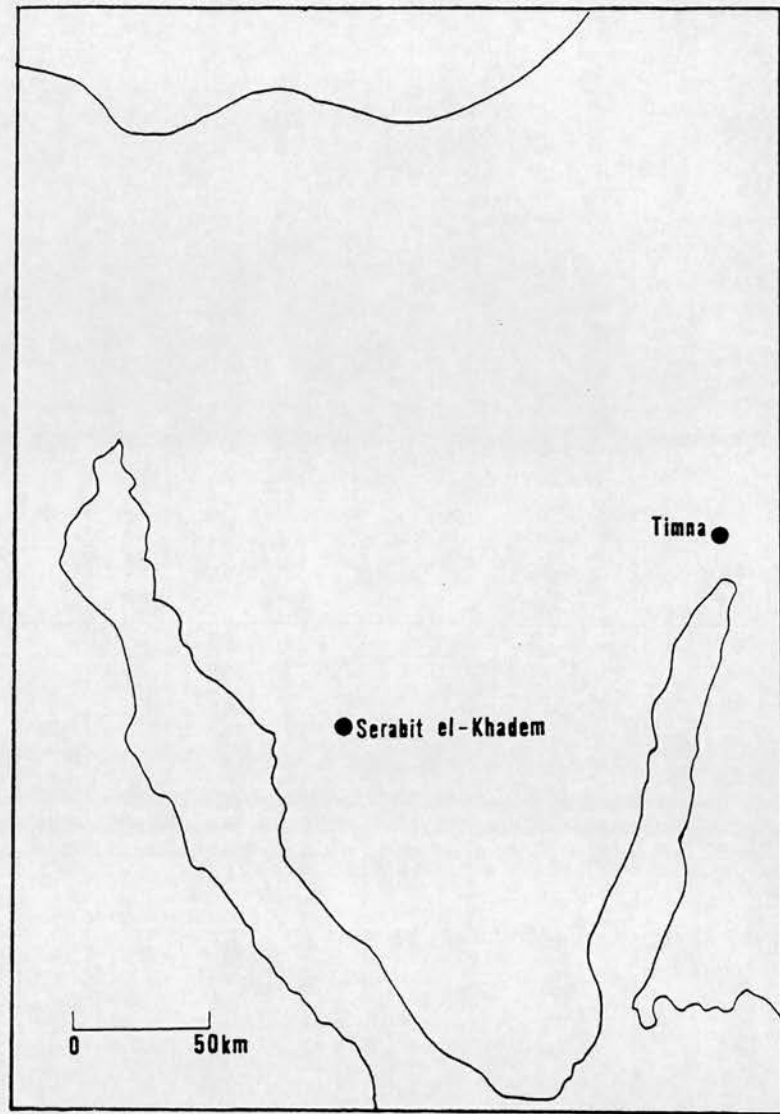
The Distribution Of Glass Vessels In Sinai: Serabit
el-Khadem And Timna

The previous chapter shows the highly restricted distribution of glass vessels within Egypt, with their production apparently a royal monopoly. Production of vessels seems to have expanded dramatically under the reigns of Amenophis III and Ahkenaten, with a seemingly drastic reduction in the scale of production post-Amarna. Given the contextual distribution of the vessels, it is probable that they were primarily personal possessions of high status. They occur in highly restricted numbers outside the production centres diffused through a number of different contexts, typically in tombs. This pattern, however, is in stark contrast to two Egyptian controlled sites in Sinai, Timna and Serabit el-Khadem (see Fig. 11:1 for location), neither of which have any evidence for the production of vessels, yet both of which have considerable quantities of vessel fragments present in a single context. Furthermore, in both examples the glass was found within a Hathor temple, and this phenomenon, vessels in ritual contexts, appears unrepresented in the Nile Valley.

Timna

Situated in the Arabah, the site of Timna consists

Figure 11:1 Location Map Of Sinai Sites Discussed



of a copper mining and smelting complex with an associated Hathor temple from which the glass vessels were recovered (Rothenberg 1972, 1988). The range of artefactual material at the site is consistent with a D19 date, and the presence of a glass vessel fragment with a cartouche of Ramesses II (*ibid*, 216 no.22), confirms that the vessel fragments too must date to D19. As such, and given the absence of securely dated D19

vessels (see above Ch.10), Timna provides valuable evidence for the description of vessels of this period. In the main, the Timna glass is highly similar to the vessels from Gurob which supports the argument advanced above (see Chapter 6), that the Gurob examples belong to D19. Tables 11:1 - 11:3 summarise the principal features of these fragments.

Although 150 fragments were found in the excavation, the organisation of the catalogue presents the data relative to individual vessels. Thus the data presented here may be taken as representing the evidence from 36 identified different vessels.

With respect to rim decoration, plain rim band decoration is confined to two bowls, but there is uncertainty from the report as to the instance of undecorated rims. It is worth, however, noting the prevalence of twisted rim band decoration as indicated by the following statement:-

"A feature common to many of the vessels is a strip made of twisted white and apparently black....glass threads applied on the rim." (ibid 215)

The glass was found in association with a number of luxury, though not necessarily prestigious objects, notably faience (including vessels), metal jewelry and statuettes. In general, the accompanying material represents a fairly mundane selection of votive objects.

Table 11:1 Vessel Morphology Timna And Gurob

Vessel Class	Timna		Gurob	
	No.	%	No.	%
I	2	9.1	2	9.1
III	3	13.6	3	13.6
IV	11	50.0	1	4.5
VI	-	-	1	4.5
VII	3	13.6	6	27.2
VIII	1	4.5	1	4.5
IX	-	-	1	4.5
X	-	-	3	13.6
XI	-	-	1	4.5
Bowls	2	9.1	3	13.6

Table 11:2 Background Colour Timna And Gurob

Colour	Timna		Gurob	
	No.	%	No.	%
Black	-	-	4	7.3
Dark Blue	13	36.1	24	43.6
Brown	-	-	3	5.5
Green	1	2.8	1	2.8
Light Blue	15	41.7	2	3.6
Purple	-	-	9	16.4
Turquoise	7	19.4	12	21.8

Table 11:3 Decorative Motif Employed Timna And Gurob

Motif	Timna		Gurob	
	No.	%	No.	%
Bands	2	6.7	-	-
Cartouche	1	3.3	-	-
Feather	11	36.7	13	41.9
Festoon	6	20.0	8	25.8
Flame	1	3.3	4	12.9
Rope Moulding	1	3.3	1	3.2
Swirl	-	-	1	3.2
Zig Zag [24]	5	16.7	-	-
None	3	10.0	4	12.9

Serabit el-Khadem

The site of Serabit el-Khadem is a turquoise mining complex incorporating a Hathor temple (Petrie 1906a).

[24] In the catalogue, the term "zig zag" is used. In those cases so described and illustrated, it appears to be more similar to distinct bands of feather decoration rather than "zig zag" as defined in this work. The primary difference is the ogival point of feather decoration, as opposed to a triangular point in zig zag as defined by this author. If the "zig zag" is considered as feather motif this increases the percentage of feather motif to 53.4%.

The temple was first constructed in the Old Kingdom and was sporadically occupied until the later New Kingdom, with major renovations being undertaken in the reigns of Amenophis III and Ramesses II. The temple contained a wide range and large quantity of exotic material, with many pieces showing royal associations. Some, at least, of the goods, for example the alabaster vessels (Leeds 1922) appear to have been produced specifically for the temple in royal workshops. The site is also interesting in the quantity and range of the faience, particularly that of D19, found in the temple.

Although Petrie makes no mention of glass vessels in his report, there is compelling evidence to suggest that this site has produced the largest assemblage of glass vessels "outside" Egypt. Three museums attribute vessel fragments to this site, the Ashmolean Museum (E.4486)(Simpson 1988, 1991), The Petrie Museum (UC 35475-35482, 35486) and the British Museum (Cooney 1974, 54). The last collection is known to originate from the site, having been donated by Major C K Mac Donald, who was instrumental in the discovery of the site (Petrie 1906a, 53). The general condition of the glass, in particular the presence of a thick red deposit (typical of the matrix at the site) on many of the fragments and the general similarity of many of the typological features, too, implies that by extension the material in the other museums may be confidently assigned to the site (Simpson 1988, 1990).

Table 11:4 Vessel Morphology Serabit el-Khadem

Vessel Class	II	III	IV	V	VII	VIII	X	XI	Bowls
Number	3	1	5	1	13	3	1	4	4

NB. XI is composed of 1 globular alabastron, 1 cylindrical jar and 2 cups.

The principal characteristics of the vessel fragments are given in Tables 11:4 - 11:7. While the glass is essentially undated, due to the broad chronological range of the contextually associated material, its typology, taken in conjunction with the historical evidence suggests that it is primarily to be dated to the later D18 - D19. It may indeed be that the majority of the glass is to be dated to D19, for it is similar to the glass vessels from Timna and Gurob, both in the high proportion of feather decoration and in the frequent use of twisted rim bands. There are, however, certain fragments which seem to be more closely linked to the later D18, for example a bilbil fragment (SKR5)[25]. A miniature globular alabastron (SKR15) is also highly similar, though not exactly paralleled by

[25] Identifying numbers refer to the catalogue numbers in Simpson 1988, but with the added prefix SK to differentiate the site from the Amarna and Gurob glass catalogued here.

Table 11:5 Background Colour Serabit el-Khadem

Black	27
Dark Blue	400
Brown	13
Green	4
Purple	5
Turquoise	252
White	9
Yellow	13
Indeterminate	252

Table 11:6 Decorative Motif Serabit el-Khadem

Bands	92
Clustered Fest.	20
Curvy Festoon	1
Feather	202
Festoon	182
Flattened Fest.	15
Random	1
Stone	3
Swirl	14
Wavy Line	1
Dots	2
Zig Zag	4
None	63
Indeterminate	330

Table 11:7 Rim Decoration Serabit el-Khadem

Rim Band	25
Striped Band	1
Twisted Rim Band	32
None	12
Indeterminate	14

vessels from the Amarna workshop in morphology, the use of an opaque yellow background and a striped rim band. Indeed, the use of yellow and white backgrounds may indicate the presence of glass vessels produced at Malqatta or Amarna. In particular, one fragment (SKF233) has a translucent white background, paralleled at Amarna by AR101, with use of this background unknown in other periods. It is also possible that certain pieces eg. R58 decorated with zig zags may represent earlier D18 glass, and others, for example the beaker (SKB10) may represent late forms. There are also two cup forms (SKR7,SKR10) represented which appear to have no parallels. Given the fragmentary and heavily weathered condition of the vessels, and also the uncertainty as to typological dating, in the absence of unequivocal evidence, the vessels will be taken as representing a broad later D18 - 19 date. Given the patronage of Amenophis III and Ramesses II, these kings provide useful brackets to the period of vessel deposition at Serabit el-Khadem.

The Similarities Between Timna And Serabit el-Khadem

In many aspects the sites of Timna and Serabit el-Khadem are very similar, and it is in these similarities that an explanation for the presence of vessels is to be sought. The first major similarity is that both were mining complexes, thus both have a similar economic value in the extraction of valuable commodities, copper at Timna, turquoise at Serabit el-Khadem. Secondly, in physical terms, both are located in inhospitable areas, distant from the centres of Egyptian power. Although wholly Egyptian settlements, which show intense activity, neither was continuously occupied. Rather mining was carried out by seasonal expeditions (Petrie 1906a, 109). Such expeditions were organised by and executed under the auspices of the court. Finally, at both sites glass vessels of the later D18-19 are present in considerable quantities, a phenomenon not witnessed elsewhere outside the production centres. It seems, then, that the two sites represent a distinct phenomenon, the occurrence of vessels in temples attached to mines. Unfortunately, remote areas have received far less attention than the densely inhabited areas, and no other sites directly comparable to Serabit el-Khadem and Timna are known. Here, in the absence of evidence to the contrary, they will be treated as a distinct cultural manifestation.

Egyptian Religion

The presence of glass vessels in these Hathor temples implies some connection with the rituals practised at the two sites, and may possibly suggest a wider link between vessels and religious customs. A number of possible interpretations may be advanced to explain their presence, but given their contexts, it seems reasonable to seek an explanation which treats the vessels as having ritual significance within the Hathor cult. Before considering the specific nature, and importance of the temples at Serabit el-Khadem and Timna, it is necessary to briefly summarise the nature of Hathor and her cult, and some more general aspects of Egyptian religion and its practice.

Egyptian religion was completely unlike Judaeo-Christianity, which has shaped Western perceptions of religion, in almost every aspect. Of particular importance is the lack of a concept of universalism, and the absence of any stress on religion as the provider of the basis of morality. Rather, Egyptian religion was a reflection of the Egyptian conception of life as an episode in an unchanging universe, the concept of Ma'at (Frankfort 1948, 46, Cerny 1952, 76). At the same time, Egyptian religion, and its practice incorporated many novel features during its history. While this appears contradictory, it presented the Egyptians with no intellectual problem.

Indeed, many of the gods incorporated contradictory roles, but this too is a common feature of many religions. (It may be argued that such a confusion is present in Christianity with respect to the vengeful God of the Old Testament and the God of salvation in the New.) Any understanding of the nature and importance of any ancient religion must be based on the "unprejudiced observation of religious-historical data and the endeavor to determine their religious significance." (Bleeker 1973, 3).

Accepting this it becomes apparent that there are two main aspects to Egyptian religion. The less important is the theological aspect, and the primary function of the priests was the enactment of rituals, with the transmission of mythological material via textual recording a secondary role. The cultic aspects are, however, highly significant, both in the formalised nature of rituals and in the expression of religious sentiment within the population who were largely excluded from active participation in worship. In material terms, this leads to a division between the objects associated with a cult. On one hand are objects imbued with a particular significance (and may largely be associated with the priesthood eg altars etc.) and on the other are artefacts with no special significance, within the formal structures of the religion, but associated loosely by the general population, either mentally or physically. For example, in the giving of

donations/offerings, a particular secular object, for instance a pot, becomes religiously significant by association, but as a class of object remains without intrinsic significance. Frankfort (1948, 4-8) noted this division between "accidental" and "deliberate" cultic associations and implied that as a result it was difficult if not impossible to interpret the role of objects in the symbolism of religions. It is this writer's view, that by association most objects found in distinctly religious and ceremonial contexts held a significance for the individuals involved in any particular religion. (It is the mental association of the contemporary population as goods being literally given to the gods which is here of particular significance.) It may not always be possible to understand the religious connotations of a specific item, but, all goods seen in religious contexts must be viewed vis a vis cult practice and be treated as potentially symbolic. This is supported by two features of the temples. First, the existence of separate buildings reserved for religious activities implies that within Egyptian consciousness there existed a recognition of the distinct nature of religious activity. Second, at both Serabit el-Khadem and Timna, the temples were not centres of economic activity, with no dependent workshops, for instance. Thus they seem to have been solely religious in function, a feature confirmed by the artefactual assemblage, which may be

described as votive in character. It seems worthwhile to seek an explanation for the presence of glass vessels at Serabit el-Khadem and Timna must then be explained with reference to the mythic symbolism and practice of the Hathor cult.

The Hathor Cult

Hathor is one of the principal deities in the Egyptian pantheon with a long tradition of worship. The New Kingdom witnessed an expansion in the worship of Hathor, and several temples were constructed or elaborated in D18-19. The principal Hathor temples were located at Deir el-Bari (Naville 1894b-1913, Kamal 1908, Winlock 1943), and Dendera (Mariette 1870-4, Petrie 1898a, Daumas 1969). Given the tendency of Egyptian religion to amalgamate gods, and the incorporation of new and contradictory attributes, there are problems in describing the most significant of Hathor's aspects. Indeed, Hathor is in many ways the epitomé of the contradictory nature which the Egyptians believed their gods to possess. Bleeker summarises Hathor's nature thus:-

"Hathor appears in so many guises that she leaves an almost chameleon like impression. On the one hand she was a fetishistic local goddess, on the other a cosmic power. Alternatively she is a cow goddess, a tree goddess, a patroness of love, of song and dance and a

bestower of all abundance, a protectress of the dead, a sky goddess, a sun eye, a royal goddess and moreover, she is concerned with foreign lands" (Bleeker 1973, 102)

Additionally, Hathor was known as the goddess of inebriation (ibid 91), and also as the "Mistress of Turquoise" (ibid 73). It will be argued below that the presence of vessels was related to certain aspects of the Hathor cult; notably her associations with royalty, foreign lands, mining and possibly inebriation. However, a number of possible explanations to account for the presence of glass vessels may be advanced. These fall into two groups, those that are generalised to all Hathor temples and those that are specific to Serabit el-Khadem and Timna.

General Association With Hathor Temples

The discussion of the previous chapter would seem to make it unlikely that vessels had a generalised distribution either in Egyptian temples or more specifically within Hathor temples. There are no contexted vessels from any of the principal temples for instance. It is, of course, possible that this represents a bias in the evidence; finds from temple sites are often poorly published with preference given to reliefs and inscriptional material. However, it is apparent that faience was reported from Hathor temples; both faience and glass, for example, are reported at

Deir el-Bari, in foundation deposits of Ramesses IV (Hayes 1959, 372). Indeed Kaczmarczyk and Hedges (1983, 252) have suggested that faience may have been produced in temple workshops. It must be accepted that the absence of glass vessels is a real phenomenon. Representational evidence does portray the offering of vessels to Hathor (eg. Mariette 1870a Pl.34), but there is no indication that such vessels were made of glass. Moreover, given the apparent distribution in Egypt, with vessels distributed via the court to individuals, it seems unlikely that they would be incorporated into general cult practice. Any explanation for the presence of vessels at Serabit el-Khadem and Timna, then, must be based on features specific to these sites.

Specific Association With Serabit el-Khadem And Timna

Two aspects of these sites must contribute to any explanation of the presence of glass vessels, the physical setting and the ideological background pertaining to them. Physically, both sites were distant from the population centres of Egypt, and had harsh living conditions. The physical isolation might suggest the possibility of a fusion of Egyptian and local customs, however, there seems to have been no significant cultural input from any local population. Rather, the remote nature of these mines and temples bound the sites more directly to royal control, both

economically and politically. Exploitation of these mines was carried out by royal parties, organised by the court and conducted under the auspices of a high official. Typical titles of the leader of the expeditions to Serabit el-Khadem are "seal bearer of the god", "chief in the department in the interior" and "chief of the land of the North" (Petrie 1906a, 111). Such titles reflect an intimate connection with the palace rather than a provincial status for the commanders of these mining expeditions. Gardiner (1955 19) has noted the number of titles at the site which pertain directly to the Treasury, confirming this court presence. Such control made for more direct royal involvement than in the temples in Egypt, where control was mediated through a partly autonomous priesthood. In practical terms, it may simply be the case that the court furnished these temples with the full range of goods available to it. This included goods which were not generally available, such as glass vessels.

Alternatively, it could be that there were certain ideological considerations which prompted the king to send glass vessels in such large quantities to these sites. Of particular importance here is the association of Hathor as both "The Mistress Of Turquoise" (an epithet found at both sites)(Petrie 1906a, 70, Rothenberg 1972, 166) and as the goddess of foreign lands. It is possible that high status goods were given to placate the vengeful goddess in return for the

removal of precious commodities, indeed the textual evidence would tend to support such a suggestion (Gardiner 1955, 153 no.182 and 162 no.200). Within such a system of belief the vessels would function as propitiative offerings.

Alternatively, or probably additionally, in the absence of a local power structure, the goods served as offerings to Hathor as a foreign goddess. Such offerings assume a less specifically religious role, but rather assume more of the character of the exchange of trade goods. Within New Kingdom society this is only explicable in terms of palace exchange (Liverani 1979, 1987, Zaccagnini 1984, 1987). In these terms the vessels may be seen as the luxury component within the political/economic trade system. In effect, the vessels were supplied in exchange for the turquoise and copper. There is, however, no textual evidence from either site to suggest that such a belief was a conscious motivation.

Finally, it could be argued that the presence of such large quantities of D19 glass may represent the elevation of Hathor in this period in the esteem of the king. Ramesses II was, perhaps due to his concern with the Empire, a major benefactor of the cult of Hathor, but this may be seen in terms of raising the prestige of the whole Egyptian pantheon, and the final eradication of the Aten heresy. At Serabit el-Khadem, moreover, the presence of D18 glass argues that the deposition of

vessels cannot solely be attributed to Ramesside interest. In the absence of specific historical evidence to explain the presence of the vessels such interpretations are obviously speculative. They are consistent, though, with the evidence that glass vessels were a monopoly of the court, and any explanation must stress the direct control of these sites by the palace. The presence of vessels at these sites, then, is only explicable by reference to the ideology of the court.

Reasons For The Specific Inclusion Of The Glass

There are three interpretations which may explain the decision by the court to send glass vessels to these distant sites. Firstly, it is possible that it was not the vessels but their contents that were donated. Alternatively, it is possible that they were included as part of a range of luxury goods, at which point the vessels have no specific iconographical significance. Finally, it is possible that certain intrinsic characteristics of the vessels led to their association in some way with the manifestation of Hathor at these two sites. It is possible from an examination of the physical evidence including the morphology and colours of the glass itself, to test these interpretations.

Given the small size of many of these vessels it seems an unlikely suggestion that their contents were economically important. It is, however, possible that

within the context of religious practice that the the contents could have gained a value completely unrelated to their economic value. Thus it is possible that small quantities of say oil, were reserved for specific ceremonies. There are good reasons, though, for rejecting such a functional interpretation for the glass vessels. First is the lack of any general connection of glass vessels as containers in the wider cultural sphere (see Chapter 7). Moreover, at both sites, bowls, totally unsuited to the transport of commodities are present. It seems more probable that the vessels were donated for their own, intrinsic, worth, with function a secondary consideration.

The glass vessels should not be considered in isolation. At both sites they were found in association with large quantities of faience, and stone vessels. At Serabit el-Khadem these stone vessels seem to have been not only of particularly high quality but also specifically made for the site (Leeds 1922). Thus in a sense the glass vessels do occur as part of an assemblage of generally high status goods. The offering lists from Serabit el-Khadem include "silver, gold, lapis lazuli and turquoise" (Gardiner 1955, 10). This does not fully account, however, for the presence of such large quantities of glass, and indeed faience. The presence of such quantities of vitreous materials is best understood in terms of the worship of Hathor at these sites.

The background colours employed in the glass give an indication of one of the reasons why it may have been present. This is the ability to produce the colour turquoise. (The same may also account for the elevated quantities of faience). Table 11:8 shows how at both Serabit el-Khadem and Timna, there are higher percentages of vessels with turquoise backgrounds. (Here the description "light blue" is included as turquoise). Particularly at Serabit el-Khadem the connection with turquoise production is apparent, but at Timna too the title "Mistress of Turquoise" for Hathor is employed. Indeed, there is a distinction made in certain Egyptian texts between "real" and "false" turquoise (Gardiner 10), with the latter probably to be equated with vitreous materials. Such a division is also known to have existed in Mesopotamia, where there is a distinction between "real" and "false" lapis lazuli, with the latter being associated with vitreous materials (Oppenheim et al 1970, 9-15) Iconographically, then, vitreous materials capable of imitating this stone may have seemed particularly appropriate offerings. Thus there may be an ideological influence behind the presence of vessels at the sites.

It is also possible that specific forms may have had a role in cult practice at the sites. At Serabit el-Khadem the presence of cups, and the presence of bowls at both sites, may indicate drinking rituals, for Hathor is the goddess of inebriation. With respect to

Table 11:8 Comparison Of Dark Blue And Turquoise
Background Frequency

	Frequency Occurrence (%) [26]			
	Amarna	Gurob	Serabit	Timna
Dark Blue	64	44	50	36
Turquoise	21	25	41	61

this it is also worth recalling specific forms discussed in Chapter 7, particularly the juglet at Amarna found with a drinking tube, as part of a wine set.

Significantly, juglets are also present at Serabit el-Khadem (SKR1,SKR5). It is possible then, that certain vessels may have played a functional role in the rituals at these temples. However, the fact that the mass of the vessels have no specific function may indicate that such ceremonial vessels constituted only a small component of the assemblage. Furthermore, at Timna, the assemblage is largely consistent with the settlement sites of Amarna and Gurob, implying no forms specifically associated with the temple.

It seems then, that glass vessels were included as

[26] The percentage figures are based on the total number of examples from the site detailed here, except in the case of Serabit el-Khadem where the indeterminate fragments have been excluded. "Turquoise" is here extended to cover "light blue" fragments.

part of an assemblage of luxury goods. However, there appears to have been a greater concentration of vitreous materials than at any other site outside the production centres. This may be explained by the fact that these sites were directly controlled and supplied by the palace, the monopoly producer of glass. Particular ideological considerations probably influenced the decision of the court to furnish these temples with glass vessels, both religious motivation in the sense of placating a vengeful goddess and also as tribute to her particular power at these sites. The vessels may also be seen in terms of an exchange with Hathor representing a foreign power, in return for valuable commodities. In such a system the preference for materials which could imitate the property of the god's stone (in this case turquoise), is consistent with the religious precepts of the Egyptians. Thus the presence of vessels at the sites is due primarily to royal supply, with the decision by the court to provide vessels dependent on the ideology of the cult of Hathor.

The Distribution of Glass Vessels In Syro-Palestine

There are fourteen Late Bronze Age sites in Syro-Palestine which have produced glass vessels; Ain Shems, Tell el-'Ajjul, Beth Shan, Deir 'Alla, Dharat el-Humraiya, Tell 'Eitun, Tell esh-Sharia, Gezer, Tell el-Jerisha, Kamid el-Loz, Lachish, Megiddo, Minet el-Beida (Ugarit) and Quryat el-Bourdj (see Fig. 12:1 for location). Most commentators have uncritically accepted the suggestion that these vessels represent Egyptian imports, a suggestion which has never been adequately scrutinised. This chapter seeks to examine these vessels in terms of their typology, date and their contextual distribution. It will be argued in particular that their distribution, is a direct consequence of the form of Egyptian political influence in this period. Before considering the implications of the presence of the vessels, the evidence from the fourteen sites will be briefly described.

Ain Shems

Two contexts at Ain Shems (Beth Shemesh) contained glass vessels, both tombs, Tomb 31 (Grant 1932, 25) and Tomb 11 (ibid 2). The former tomb is not fully detailed in the final report, but the find of an iron bracelet from the same context is noted. The latter, Tomb 11, contained multiple burials, with the internments

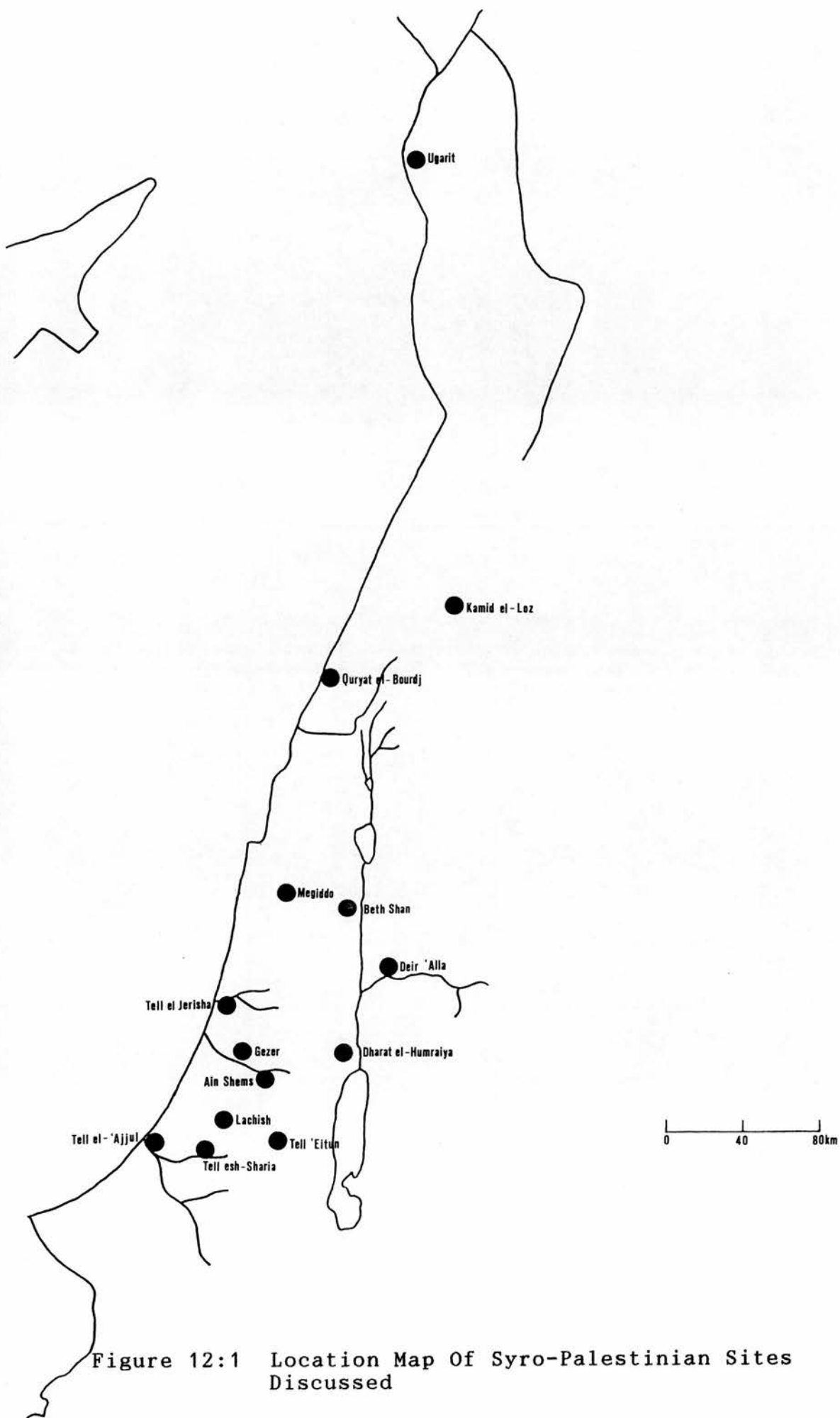


Figure 12:1 Location Map Of Syro-Palestinian Sites Discussed

taking place over a period of some 200 years, covering the period c1350-1150 BC. This dating is based on the presence of scarabs of Amenophis III and Ramesses II, and on the inclusion of painted pottery jars identical to examples from the Tomb of Tutankhamun (ibid). The example from Tomb 31 is described only as a fragment of the base of a vessel, with the vessel from Tomb 11 equally undescribed in the report. Nolte (Glas. 94 no.22) provides a description of this example, a dark blue krateriskos (IV) with yellow and white festoon decoration on the neck and body.

Tell el-'Ajjul

There are four identified tombs at Tell el-'Ajjul which contained glass vessels; Tombs 1035, 1037, 1514 and the "Governor's Tomb". In addition, there are two further examples, which were also probably from tombs. Finally, Petrie mentions fragments and isolated pieces" (Petrie 1934, 19).

Tomb 1035 contained a krateriskos (no. 139) (Petrie 1932a, 10), with a plain rim band and a pedestal base. Other artefacts in the burial included D18 alabaster vessels, pottery and scarabs (ibid Tomb Register).

Included in Tomb 1037 alongside a spherical bodied krateriskos with a pedestal base (no. 144)(ibid), were a scarab of Amenophis III, a silver ram, arrowheads and 5

alabaster vessels (ibid 8).

Two vessels were recovered from Tomb 1514 (ibid 15-16), a krateriskos (ibid 10 no. 140), decorated with a plain rim band, festoon on the neck and wavy band decoration on the body, this krateriskos has a stump base. The second vessel is probably a flask (ibid no. 141) with a green background and unmarverred blue bands on the body. Tomb 1514 was a rich tomb containing a gold Hathor amulet, a large dagger, copper arrowheads, a bone kohl tube and pottery (ibid 15-16).

The "Governor's Tomb" is an extremely wealthy stone built tomb (Petrie 1932b). This burial included, for instance, a gold ring of Tutankhamun and other gold objects, a silver ring, bronze arrowheads, cylinder seals and a scarab of Ramesses II. Two vessels were found in this tomb, a krateriskos described as "like 139" (op cit), i.e. a long necked krateriskos with a pedestal base and a plain rim band. The second vessel (ibid 11 no. 419) is a flask, described as dark and decorated with streaks.

One of the unprovenanced vessels may be tentatively identified as a krateriskos decorated with bands; presuming that Petrie's assertion that " it is like one with scarabs of Amenophis III found before" (Petrie 1934 11), refers to the vessel and not to the associated gold crescent. As the other examples are noted only as fragments (ibid 11, 19), and with no contextual information, they will be excluded from the

following discussion.

Beth Shan

The site of Beth Shan has produced a considerable quantity of vitreous objects, including glass vessels (Rowe 1940, Mc Govern 1991, forthcoming). With the exception of one pedestal base fragment (Mc Govern forthcoming F. No. 28.10.202a) found in locus 1383 (in the migdal), all the vessels described by Mc Govern are listed as coming from below the floor or steps in the Level VIII altar room (Mc Govern forthcoming). Rowe noted the widespread distribution of vitreous objects (of unspecified type) "from other parts of the room and from under its floor" (Rowe 1940, 9). It seems incontrovertible that the vessels are to be associated with the heavily Egyptianised temple. This temple is exactly paralleled by the mortuary temples at Amarna for instance, (Mc Govern 1991, 17), showing the close cultural connection. While the Level VIII-VII temples may be firmly linked to the 13th century BC, in the period Seti I - Ramesses II on the basis of inscriptional evidence, and the associated assemblage, it is possible that the vessels represent hold-overs. Rowe noted, for example, that the deposit below the stairs contained a faience ring of Amenophis IV (Rowe 1940, 9) Moreover, in the absence of any suggestion that these deposits were not sealed by the Seti period

temple floor, it is a possibility that they may belong to the earlier use of the temple. A broad date of later D18-19 then, must be assigned to the vessels.

Typologically the vessels confirm this broad date, with the high incidence in the use of twisted rim bands potentially indicating a D19 rather than D18 date. Given the uncertainties about the chronological development of the vessels, however, this more specific date must remain largely speculative. There is a total of eight vessels:

F 26.8.101a, a green blue amphoriskos with yellow and white decoration and a yellow and white twisted rim band.

F 26.8.101b, a white pomegranate vessel with yellow tips on the sepals.

F 25.11.415, a white flask with yellow decoration and a grey and white twisted rim band.

F 26.8.71 a-b, a flask.

F 26.8.44, a mottled blue green flask.

F 26.8.99, a black and white amphoriskos.

F 26.8.47, a white amphoriskos with yellow and white decoration.

F 26.8.98, a white fragment with black decoration.

It is important to note that the glass is heavily weathered, and the identification of the original colours is problematic. In particular, "white base glass is probably more prevalent in the Beth Shan corpus as a

result of weathering and leaching" (Mc Govern forthcoming).

Deir 'Alla

The temple at Deir 'Alla has produced a glass vessel from a room to the east of the cella "which served for the storage of 'precious' objects" (Franken pers comm and forthcoming). The glass vessel is a yellow lentoid flask with white feather decoration on the body, bordered by white bands (Glas. 117 no.31). Other objects found in this context in association with the vessel include clay tablets, pottery, faience and stone vessels. This deposit is sealed by a destruction level dated c1200 BC, both by the associated objects, including a seal of Tewosret, the wife of Seti II (Amiran 1969, 197), and radiocarbon determination.

Dharat el-Humraiya

One grave at the site of Dharat el Humraiya, Grave 8, contained a lentoid flask with white wavy line decoration, and a fragment of a "pear shaped vessel" (Ory 1948, 80-81). The latter fragment is probably from a krateriskos. This grave contained significant quantities of gold jewelry, with four rings, 30 lotus pendants, 2 beads and a gold setting for a steatite ring. Also present were pottery vessels, a fragment of a

faience vessel and an ivory kohl tube (ibid).

Tell 'Eitun

A cave burial with multiple internments, at Tell 'Eitun has produced a vessel which has no typological parallel in Egypt (Barag 1970, 148, Harden 1981, 36, Tzaferis & Hess 1992, 9 and Fig. 6 no.1). This vessel has a tubular form (similar in profile to a kohl tube), with a five pointed pomegranate-like calyx. While Barag's and Tzaferis and Hess' (op cit) descriptions are contradictory, it appears that the vessel's background has faded to yellow, and it is decorated with blue and white feather motif with vertical stripes through the points of the feather decoration. (There are other examples of such vessels in Syro-Palestine and Cyprus, and their significance is discussed in detail below.)

This vessel was found in a paved part of the tomb near a particularly dense concentration of finds, consisting mainly of pottery but also including toggle pins characteristic of the later Late Bronze Age, copper tweezers and a bronze ear-ring (Tzaferis & Hess 1992, 12).

Tell esh-Sharia

A glass vessel is reported from a refuse pit

outside an "official" building at Tell esh-Sharia (Oren 1973b, 13). There are two such pits containing animal bone, faience vessels, pottery, D19th hieratic inscriptions and a group of D19th scarabs and seals, including one of Ramesses II. The adjacent building appears to have functioned in a ceremonial role. The vessel is described only as " a glass bottle with gold bands" (ibid).

Gezer

Glass vessels typical of the Late Bronze Age, were recovered by Macalister at Gezer. Two fragments are illustrated (Macalister 1912 Fig. 392): a lentoid flask with a grey background (ibid) (probably representing weathering), with yellow and white flame decoration bordered by bands and a twisted rim band. The second fragment appears to be a spouted rim with festoon decoration and a plain rim band, apparently in the same colours as the previous example (ibid). Neither fragment, however, has a described context. Other fragments were also found by Macalister who noted that they were "small and incoherent" (ibid). One specific context, the Water Passage, contained "a fragment of an Egyptian glass vessel" (ibid 265), but the objects here "had obviously silted in by accident and had no radical connection with the excavation" (ibid 264).

Macalister also describes glass vessels in several

other tombs, which seem to consistently date to a later period, eg. Tomb 2 (ibid 292). Finally, in Tomb 12 "some fragments of a glass vase were found" (ibid 309), this tomb, however is undated, and it seems wisest to exclude it as an example of a tomb with Egyptian glass.

Subsequent excavation of a cave burial at Gezer (Seger 1972 no pagination) confirms the presence of glass vessels at the site. Associated with a female burial, in a cave used for multiple internments, is a krateriskos (Fig. 18) with a dark background, light and dark festoon decoration and a plain rim band. The other objects associated with this individual are not fully described, but include pottery consistent with an early 14th century date. The form and decoration of the glass vessel are consistent with this date.

Tell el-Jerisha

A tubular bottle similar to that from Tell 'Eitun was found at Tell el- Jerisha (Barag 1970, 148, Harden 1981, 36), although no contextual information is recorded for this example. Presumably, this vessel has the same tubular shape, pomegranate rim and decoration of the previously described example from Tell 'Eitun. It is uncertain, however, which colours of glass were employed on this vessel.

Kamid el-Loz

There are at least four vessels represented by fragments in one building, termed "The Treasury", at Kamid el-Loz (Miron 1990, 103). All but one of the fragments (467) were found in Room S (467 was found in the adjoining Room T), in association with a wide range of artefacts including stone, metal and ivory vessels and jewelry (ibid 18-19 and Abb. 2). A large basin had been dug in Room T contemporary with its use. Room S, from which the majority of the finds were recovered, had an intrusive burial assigned by the excavators to secondary squatter occupation. The building is connected spatially to both the palace and the temple, and it is tempting to interpret it as a repository dependent on these institutions. It is, however, equally possible that the concentration of goods represents scavenging by the squatter(s). Certainly the goods accompanying the burial would support the latter interpretation. It therefore becomes difficult to interpret the contextual significance of the vessels, and the building's function, as the excavators recognised (ibid 19).

The vessels represented in room S are:

- 459 - a brown lentoid flask with a plain rim band, wavy line decoration on the neck, and dark blue and white feather decoration on the body.
- 460 - a dark fragment, possibly blue, with yellow and white festoon decoration.

461 - a rim fragment, probably from a flask, with a wavy rim band and festoon decoration in white.

462 - a dark lentoid flask, possibly blue with a yellow band around the neck and white festoon decoration.

463 - a blue flaring rim fragment from a jug, possibly of bilbil form [27].

464 - a body fragment from a krateriskos decorated with white wavy lines and square edged horizontal grooves. This vessel had a pedestal base.

465 - a shoulder fragment with a strap handle attached.

466 - a neck to shoulder fragment.

From Room T comes:

467 - a shoulder fragment from a krateriskos, probably the same vessel as 464.

On typological grounds, Schlick-Nolte (pers comm) assigns these vessels to D18, associating them with the vessels produced in the reign of Amenophis III.

Lachish

Five vessels were found in the "Platform of the

[27] Schlick-Nolte has suggested (pers comm) that this may represent a bilbil. Certainly the published drawing does not accurately reflect the profile of this piece. On such a small fragment it is difficult to be certain. For instance there is no identification of the length of the neck.

Shrines" in the Fosse Temple at Lachish (Tufnell et al 1940, 19), associated with a range of exotic goods, such as faience, stone vessels and ivory plaques. The destruction of this temple (Structure III) is associated with the campaigns of Ramesses II, with the burning of the altar deposits associated with his military actions. It should be noted, however, that the vessels may date earlier, for as Tufnell noted;

"Some at least of the objects were more than a hundred years old when the temple was destroyed" (ibid). There is a total of five vessels at Lachish. A dark blue krateriskos with yellow white and possibly turquoise feather decoration (Glas. 110 No.37). A dark blue lentoid flask with yellow and white feather decoration (ibid 118 no.33). An amphoriskos in fragmentary condition decorated with feather pattern (ibid 119 no.4), and two dark blue kohl tubes decorated with yellow and white festoon on their shafts (ibid 142 nos. 10 and 11). All the vessels have been discoloured by the fire in the altar room.

Megiddo

Three vessels and a base fragment were recovered in excavations at Megiddo. The base fragment, described as faience (Lamon & Shipton 1939, 101), was found in the dump of Schumacher's excavations, and is hence uncontexted.

The building termed by Schumacher the "Mittelburg" has produced two vessels: a pomegranate vessel decorated with yellow and black bands (Watzinger 1929, 17), and a single handled jug with festoon decoration (Loud 1948 182, Pl. 191:4). This building was described by Loud after re-excavation as "a large court building perhaps a lesser palace" (ibid 113-4). The jug was found in a courtyard of this complex, context 5020 (ibid). The vessels were associated with a range of artefacts including a marble bowl fragment, a bronze ring, beads (Watzinger 1929, 17), scarabs, a bronze arrowhead, a bronze hoe (?), and gold and faience pendants (Loud 1948 182). The presence of an altar in the court (ibid 113-4) suggests that this area served as a centre for ceremonial activity. From the evidence of the associated artefacts it seems that the context is to be dated to the first half of the 14th century.

A neck from a glass jug was found in context 1787 (ibid 113), general occupation deposits in an area of residential buildings. This context contained a number of artefacts including faience bowls, a bronze arrowhead, beads and other items of jewelry, a paste scarab, a carnelian seal, whorls, an ivory cover and disk and other artefacts. In this area it seems that strata VIIB and VIIA were not clearly separated, therefore the vessel may be placed, in general terms at the beginning of stratum VIIA, that is contemporary with the early 19th Dynasty.

Minet el-Beida (Ugarit)

One tomb at Minet el-Beida (the harbour town of Ugarit) contained vessels. Tomb VI was a multiple internment tomb with which two vessels are associated. One vessel was recovered from the tomb itself, while the other was found in the covering deposit overlying this tomb. The date of the tomb is indicated by the ceramic assemblage, in particular, "every Mycenaen vase is of IIIB type" (Furumark 1972b, 68), indicating a late 14-13th century date. This tomb may be characterised as exceptionally rich with gold jewelry, alabaster and ivory. "Mais ce qui caractérise surtout le mobilier de la tombe VI c'est l'extraordinaire abundance des vases, gobelets, assiettes et bouteilles en faïence, en porcelaine tendre et en verre multicolore." (Schaeffer 1933, 105). Furthermore, vitreous materials were absent from the other contemporary tombs (ibid 109). This tomb is exceptional in both the quality of the artefacts and also in its physical size, being nearly double the size of the other tombs. It thus seems probable that this tomb was of higher status than the remainder. The presence of tubes leading into Tomb VI, have been interpreted as implying libations (ibid 107), and thus it may be that this tomb was also a focus of ritual activity. The vessels recovered are; a jug of bilbil form, apparently dark grey-black with feather decoration on the neck and festoon decoration on the body, both

apparently yellow and white, although there is significant weathering leading to discolouration (Glas. 86 no.19a). The other jug is heavily weathered, but a blue background with yellow and white irregular festoon decoration on the body is visible (Glas. 95 no.24a).

Quryat el-Bourdj

A greyish blue flask decorated with a "winding pattern" in yellow and white on the body and greyish white and blue twisted rim band is known from a rock cut tomb at Quryat el-Bourdj (ibid 117 no.28). Unfortunately no further information on the associated objects, date etc. was available to the author at the time of writing.

Discussion

Independent Manufacture

Before considering the contextual distribution of the glass vessels it is important to establish whether they were imported Egyptian goods or represent the product of a local or other industry.

That there was vitreous manufacture in Syro-Palestine is well attested in a range of small objects in both faience and glass of typologically local form. This local vitreous industry is well represented

at Beth Shan in faience pendants, such as a ram's head, seven rayed star disc and crescent with horns (Mc Govern 1991, 19). In addition, at Beth Shan, certain manufacturing elements were found, such as a frit cake (ibid 21), suggesting the manipulation of glass and glazes. There were, however, none of the principal components of the glass vessel industry, rods, flakes and blocks which characterise the known Egyptian production centres (Amarna, Malqatta and el-Lisht). Moreover, compositional analysis undertaken on material from Beth Shan suggests that two groups are represented in the vitreous assemblage, a local industry and a group chemically identical to known Egyptian examples. Significantly, the latter group includes the glass and faience vessels, which Mc Govern believes to be Egyptian imports (ibid 20).

In typological terms, too, most of the vessels can be paralleled in Egypt. There are, however, three forms represented which may well have a non-Egyptian origin, the bilbil jug, the pomegranate vessel and the tubular bottles (Harden's Group F). An examination of the distribution of these vessels suggests a Cypriot or Syro-Cypriot origin for these vessels.

Bilbils

The Cypriot bilbil form jug has a widespread distribution in pottery in the Eastern Mediterranean and

Egypt in the LBIIA (cf Amiran 1969, 173 and for specific discussion Merrillees 1968, 154ff). The example from Minet el-Beida Tomb VI is one of only a few examples without neck rings of this form in glass (Glas. 162, Harden 1981, 35), with no provenanced examples from Egypt. Two fragments have been identified in assemblages which may be presumed to be Egyptian, at Serabit el-Khadem (SKR5) and Kamid el-Loz (463). As only a small portion of the neck survives on both these examples, it is difficult to be certain that they are representative of this class. Two provenanced examples of this form are known from Cyprus; one from Hala Sultan Tekke the other from Ayios Jakovos (where the rim is missing) (Harden 1981, 35). The example from Minet el-Beida is a very close parallel to that from Hala Sultan Tekke. In addition exact parallels of the pottery examples are also present in Cyprus (Åstrom 1967, 58). On typological grounds it is reasonable to conclude that the Minet el-Beida example may reasonably be "thought of as Syro-Cypriot" (Harden 1981, 35).

Pomegranate Vessels

The pomegranate vessel is represented in Egypt at Gurob (GR6), and at the Egyptian sites of Serabit el-Khadem (Simpson 1988 SKR4, SKR18, SKR19) and Timna (Rothenberg 1988, 215-6 no. 22). There are, though, minor but consistent traits which suggest that a form of

this vessel was produced in Cyprus, for while the known Egyptian vessels are stylised representations of pomegranates with the sepal tips rounded, examples from Cyprus are more naturalistic. On Cypriot examples the sepal tips are, in general, more pointed; in addition two examples from Kition (Karageorghis 1985, 905/3, 4213) have small protrusions at the base of their bodies as on the real fruit (author's personal observation [28]). Moreover, this form is common in Cyprus with 13 examples from the site of Enkomi alone (Åstrom 1967, 58, Harden 1981, 37 for summary of distribution) suggesting their independent manufacture on the island. Of the two examples of pomegranate vessels recorded in Syro-Palestine, the Beth Shan example appears to belong to the typologically Egyptian group. The Megiddo example, however, shows closer affinity with the Cypriot examples and hence may represent a non-Egyptian vessel.

Tubular Bottles

The tubular bottle (Harden's Group F, 1981, 36) are a distinctive typological class with their narrow bodies, and calyx-like rims. Four examples, only one

[28] The author was able to examine these fragments with the assistance of a travel grant from the British School At Jerusalem, the co-operation of the department of Antiquities of Cyprus and the excavator V Karageorghis.

contexted, are known from Syro-Palestine: Tell 'Eitun, Tell el-Jerisha, from the Hebron area and an unprovenanced example. There are no parallels for these bottles at any Egyptian site. There are, however, several Cypriot examples of this form (Åstrom 1967, 58-59, Harden 1981, 36), for instance at Hala Sultan Tekke, Maroni and Arpera. Significantly the sepals on these vessels exhibit the characteristic naturalistic form of the Cypriot pomegranate vessels. Harden has observed that these vessels "must originate in Cyprus or on the Levant Coast" (ibid).

A Cypriot Glass Vessel Industry ?

On the basis of established typological differences, and a defined and distinct distribution pattern, it seems reasonable to postulate vessel production in either Cyprus or Syro-Palestine. Given the absence of manufacturing debris in Syro-Palestine, or other indicators of a local glass vessel industry, it would appear that the vessels must represent imports. Cyprus appears an obvious candidate for production centre for these vessels. There is, however, no evidence in Cyprus either for the types of manufacturing debris associated with the production of vessels.

Space precludes a full examination of the Cypriot evidence, but a few observations may be stated in support of the existence of an independent tradition of

vessel production on Cyprus. Two points will suffice to illustrate this possibility. First is the existence of a distinct tradition of vitreous manipulation in the Cypriot faience industry, with the manufacture of complex artefacts. This is reflected in typological terms; as exemplified in the Kition rhyton, a piece regarded by the excavator, of definite local manufacture (Karageorghis 1985). Furthermore, Mc Kerrell has suggested that the composition of the faience objects from Kition is probably not Egyptian (Karageorghis 1979). The ability to produce complex faience objects suggests that the technological and social conditions necessary for glass vessel production existed on Cyprus.

The second argument cites the relatively high incidence of glass vessels in Cyprus, with examples at many of the principal Late Cypriot sites, with vessels at Kition, Maroni, Enkomi, Kalavassos Ayios-Dhimitrios, Hala Sultan Tekke, Kourion and others. (For a summary of the Cypriot evidence see Harden 1981, Åstrom 1967). Moreover, at certain of these sites, particularly Kition, Enkomi and Hala Sultan Tekke, there is a particular concentration of glass vessels, with more examples from each than at any site in Egypt other than the production centres and royal sites. For instance, at Kition the fragments may represent nine vessels (Karageorghis 1985, personal observation), and at Enkomi there are many more (Åstrom 1967, 58-59). Coupled with the evidence of distinct forms associated with Cyprus,

it seems reasonable to assume the existence of an independent glass vessel industry.

Also present on Cyprus are vessels which are exactly paralleled in Egypt; the round bodied amphoriskos, round bottomed jugs, lentoid flasks and base disc jugs. It is impossible, at present, to determine whether these vessels were locally produced or Egyptian imports. Harden 1981, 32) suggests that these vessels probably do represent Egyptian pieces, but it must be equally possible that they were Cypriot, given the currency of these forms in pottery in the Late Cypriot period.

While the case for an independent glass vessel industry on Cyprus is unproven, the typological and distributional evidence strongly supports its existence. Unfortunately, the presence of similar forms in both Cyprus and Egypt has repercussions for the current study, and it is not always possible to identify the place of manufacture of the Syro-Palestinian vessels. Moreover, given the widespread distribution of artefacts produced in both Egypt and Cyprus in the LBII, it is apparent that Syro-Palestine may have been supplied with vessels from both sources. This is apparent from an examination of the artefacts associated with the examples of glass vessels in Syro-Palestine.

Associated Artefacts

Nearly all the examples of glass vessels in Syro-Palestine are accompanied by both Egyptian and Cypriot artefacts, the former primarily scarabs, the latter principally as pottery vessels. For the purposes of this discussion it was accepted that it is probable that most of the vessels represent Egyptian imports. Given the uncertainties concerning the origin of forms represented in both Egypt and Cyprus, coupled with Egyptian political and social domination of Syro-Palestine, this seems a reasonable assumption. Where, however, the vessels seem to be of typologically Cypriot form (the Megiddo pomegranate vessel, the Minet el-Beida bilbil, and the tubular bottle from Tell 'Eitun) contextual information was examined to assess their potential source.

Significantly, Ugarit was outwith the sphere of Egyptian political domination and this is reflected in the contents of Minet el-Beida Tomb VI [29]. The finds in this tomb are largely of Cypro-Aegean character, as witnessed both in the considerable quantity of LHIIIB pottery, and the faience repertoire which is

[29] Here and throughout the remainder of this chapter to avoid repetition, the reader is referred to the preceeding descriptions for bibliographic references to the specific contexts containing vessels.

stylistically Cypro-Aegean in form. It seems reasonable to infer that the vessels represented in this tomb are liable to be Cypriot rather than Egyptian pieces. With respect to Megiddo, it is certainly located in the sphere of Egyptian domination. Moreover, the "Mittelburg" as a complex contained many Egyptian items, and the vessel is itself associated with a scarab. The acceptance of this vessel as a Cypriot example then, rests solely on the acceptance of the typological arguments advanced above.

The tubular bottle from Tell 'Eitun almost certainly represents a Cypriot product on typological grounds. This is supported by the lack of Aegyptica in the tomb and the presence of considerable quantities of Cypriot pottery.

Accepting that there existed a Cypriot glass vessel industry, it seems probable that the vessels from Minet el-Beida Tomb VI and Tell 'Eitun do represent Cypriot produced vessels. It is also possible that the pomegranate vessel from Megiddo was a Cypriot import. Significant reservations, however must exist in the absence of a proven Cypriot glass vessel industry, and the above vessels will be included in the following discussion of the distribution of the Egyptian vessels in Syro-Palestine. It should be noted in advance, however, that the distributional evidence reinforces the possibility that these vessels were not of Egyptian manufacture.

Table 12:1 Dated Contexts In Syro-Palestine Containing
Vessels

Date	Identification
D18	Tell el-'Ajjul 1035
D18	Tell el-'Ajjul 1037
D18	Tell el-'Ajjul 1514
D18	Dharat el-Humaraiya 8
D18	Gezer (Sarah)
D18	Kamid el-Loz
D18	Megiddo Mittelburg
D18	Megiddo 5020
D18-19	Ain Shems 11
D18-19	Lachish
D18-19	Tell el-'Ajjul 'Governor's'
D19	Beth Shan
D19	Deir 'Alla
D19	Tell 'Eitun
D19	Megiddo 1787
D19	Minet el-Beida VI
D19	Tell esh-Sharia

The Date Of The Vessels

Table 12:1 lists the range of dates represented by the contexts with glass vessels in Syro-Palestine. These

dates are derived from two sources, the typology of the vessels and the associated artefacts. (Dates are given in terms of Egyptian Dynasties to facilitate comparison with other material discussed in this work.)

As discussed in detail above (Chapter 6), there are significant problems in relying on typological features to date the vessels, especially where they occur as single examples. This difficulty is compounded by the probability that Cypriot glass vessels also appear to be present in Syro-Palestine. Thus minor typological variation may have cultural rather than chronological implications. Certain features, however, such as the form of rim decoration, and the presence of specific forms such as pedestal bases, may indicate the date of particular examples. Furthermore, the complete, or nearly complete, condition of many of the vessels under discussion may provide possible comparisons with known dated examples.

Dating by associated artefact evidence is more reliable, but was not possible in every instance. There are, though, limitations on this evidence. First, that hold-overs were a relatively common feature in Late Bronze age deposits is well established, and certainly pertains to the culture under discussion, for example in the Fosse Temple at Lachish. There are also reasonable grounds for the widespread circulation of scarabs, particularly those of Amenophis III, for many years after the reign of the named pharaoh.

There are also specific problems relating to the identification in Syro-Palestine of Aegyptica from the reign of Akhenaten. Weinstein (Weinstein 1981, 16) has discussed this problem, arguing that such material is present, primarily as pottery, but has not been identified. The absence of the most typical form of Aegyptica, the scarab, may be explained by reference to the non-production of such seals during the Amarna period because of their iconographic significance within traditional Egyptian religion. As the evidence from Amarna shows however, seals with the cartouche of Akhenaten were common, especially in the form of rings. There are also very few items, such as the painted pottery jars in Ain Shems 11, in Syro-Palestine which may be linked to Akhenaten's reign. Furthermore, there is an absence of inscriptional material from this period in Syro-Palestine. While this may partly be explained by the efforts of later kings to eradicate the traces of the 'heretic', it is also consistent with the cultural history of the Amarna period. It has been argued above (Chapter 10) that this period saw an attempt to establish the power of the king as a charismatic monarchy. It is valid to suggest that much of the artistic and craft production of this period was diverted to the glorification of the new capital city. In Egypt, the distribution of glass vessels seems to be particularly influenced by these changes. A genuine absence of material dating to the Amarna period in

Syro-Palestine may also reflect this cultural shift. It is, however, impossible to separate the majority of the glass vessels from Malqatta and Amarna on typological terms, and so it is unrealistic to say with certainty that the vessels in Syro-Palestine do not date to the reign of Akhenaten.

D18 Contexts

The dating of the D18 contexts at Tell el-'Ajjul 1037 and 1035 is based on the presence of scarabs, and also the pottery assemblage: the vessel from Tomb 1514 has wavy line decoration and a plain rim band also suggestive of this date. At Gezer (Sarah) the ceramic assemblage indicates a date in the reign of Amenophis II, and the form of the vessel accords with this date. The pottery from Dharat el-Humraiya Tomb 8, including a bilbil, and the form of the other associated objects indicates a D18 date. At Kamid el-Loz the form of the vessels, especially the prevalence of plain rim bands, and the associated artefacts provide a similar date. The dating of the Megiddo examples from the Mittelburg/5020 depends on assigning this phase of the site to D18 on the basis of the pottery, a suggestion that gains support from the presence of a bilbil in Stratum VIII. Ain Shems Tomb 11 presents problems of interpretation due to the presence of a scarab of Ramesses II, but this tomb was used for multiple internments over a

considerable period. That some of the material is to be dated to D18 is indicated by the painted pottery jars examples of which were found in Tutankhamun's Tomb. The form of the krateriskos from Ain Shems was considered by Nolte to be similar to those of the Malqatta vessels. Given the similarity of this material to that of Amarna, a date in the later D18, on the basis of the painted jars, is to be preferred. Thus with respect to the suggestion above that there may have been a hiatus in the availability of glass vessels in Syro-Palestine during the Amarna period, the last two examples may suggest that this is unfounded.

D18-19 Contexts

Both the Fosse Temple at Lachish and the 'Governor's Tomb' at Tell el-'Ajjul contain material which spans the period D18-19. At Lachish, for example, there are Amenophis III scarabs and also later inscribed material: the ceramic assemblage also testifies to a chronologically mixed deposit. The form of the vessels themselves is not particularly indicative. While the presence of plain rim bands and pedestal bases might be taken to indicate a D18 date, the presence of feather decoration as the principal decorative motif could be used in support of a D19 date. For the purposes of this study, what is of greater significance is that these vessels were still in use in D19, being damaged in the

destruction of the fire in the altar room that marks the end of the temple. While not necessarily produced in D19, here the Lachish vessels will be treated as coeval with the D19th contexts to be listed below, because of the continued use of the vessels in the D19th period temple.

The 'Governor's Tomb' has multiple burials with dating evidence in the form of a ring of Tutankhamun and a scarab of Ramesses II which confirm the use of this tomb in both Dynasties. In terms of the forms of the vessels, the flask is not particularly indicative, but the krateriskos, with a plain rim band and pedestal base shows affinities to D18 examples. This tomb comprised two strata, and it is perhaps significant that the vessels occur in the Lower Stratum (Petrie 1932b Pl XIV), which offers support for the earlier date. Finally, the other examples of glass vessels at Tell el-'Ajjul are all to be dated to D18, and this may suggest that these vessels too are to be similarly dated. In the following discussion a D18 date will be accepted for the vessels from the 'Governor's Tomb'.

D19 Contexts

The dating of the D19 contexts is established by the associated artefacts. The presence of LHIIIB pottery provides the basis for the date of Minet el-Beida Tomb VI, and is also present at Tell esh-Sharia and Deir

'Alla. In addition at both Tell esh-Sharia and Deir 'Alla a D19 date is confirmed by scarabs. Scarabs, and other inscriptional material (including the Beth Shan Stela) provide a consistent D19th date for the temple at Beth Shan. Tell 'Eitun is dated to the "later Late Bronze Age" (Tzaferis & Hess 1992, 12) by both the ceramic assemblage and the form of the toggle pins. Megiddo 1787 is similarly to be dated to this period on the basis of the ceramic evidence of Stratum VII. (Although the poorly understood stratigraphy of this sounding leaves considerable scope for the exact dating of this vessel.) Significantly, most of the vessels seem to be particularly associated with the reign of Ramesses II, although given the long reign of this king, and his involvement in Syro-Palestine this is not particularly surprising.

The Contextual Distribution Of The Vessels

Table 12:2 lists the broad context types in which the vessels occur in Syro-Palestine. It can be seen that a broad division exists in chronological terms in the types of context represented, with the D18 examples principally in tombs, and with the incidence of vessels in temples confined to D19.

Table 12:2 Types Of Context Represented In
Syro-Palestine With Vessels

Type	Date	Identification
Tomb	D18	Ain Shems 11
Tomb	D18	Tell el-'Ajju1 1035
Tomb	D18	Tell el-'Ajju1 1037
Tomb	D18	Tell el-'Ajju1 1514
Tomb	D18	Tell el-'Ajju1 Governors
Tomb	D18	Dharat el-Humraiya 8
Tomb	D18	Gezer (Sarah)
Tomb	D19	Tell 'Eitun
Tomb	D19	Minet el-Beida VI
Official	D18	Kamid el-Loz
Official	D18	Megiddo Mittelburg/5020
Official	D19	Tell esh-Sharia
Temple	D19	Beth Shan
Temple	D19	Deir 'Alla
Temple	D19	Lachish
Domestic	D19	Megiddo 1787

Tombs

The distribution of vessels in D18 tombs is well

attested, however, there are two exceptions to the association of tombs with D18 vessels, Minet el-Beida Tomb VI and Tell 'Eitun. As suggested above, there are reasonable grounds for assigning these vessels to a Cypriot origin. Moreover, in both tombs there is an absence of Aegyptica and a prevalence of Cypriot (or Cypro-Aegean) imports which further reinforces the idea that these glass vessels were not Egyptian. If this is accepted then it appears that the tombs containing glass vessels are all to be dated to D18.

Official

The three contexts which have been classed as 'official', Megiddo Mittelburg/5020, Tell esh-Sharia and Kamid el-Loz are all located in buildings which may be connected to government activity. At Megiddo, two contexts containing vessels, the Mittelburg and 5020 are part of a building complex described by Loud as a "lesser palace" (Loud 1948, 113). At Tell esh-Sharia, the vessel occurs in a pit outside a building which seems to have served as an Egyptian administrative centre, given the details of tax returns in the hieratic inscriptions. Kamid el-Loz, however, has a high degree of uncertainty as to the association of the vessels directly with official activity at the site. Squatter activity appears a reasonable explanation for the concentration of vessels in the "Treasury". It is,

however, possible that the vessels were looted from the adjacent palace. Considerable uncertainty must accompany such an interpretation, and of equal significance is the possibility that the vessels were from the nearby temple. It appears unwise to speculate on the distribution of the vessels at Kamid el-Loz, but they do confirm the presence of vessels in Syro-Palestine in D18 as other than tomb goods. This is of some importance, for while the jug from Megiddo may be Egyptian, the pomegranate vessel has greater affinity with the Cypriot examples.

Domestic

Moreover, Megiddo also has the only incidence of a glass vessel in a context which may be classed as 'domestic'. In the case of Megiddo 1787, this term is employed loosely to describe a general deposit between buildings in what appears to be a residential area. It must be observed, however, that this area was subject to less intensive investigation than other areas. Taken together, the presence of a potentially Cypriot vessel, and the incidence in a residential area, may suggest that the distribution of the vessels at Megiddo exhibits anomalies in terms of the pattern represented elsewhere in Syro-Palestine. It will be argued, however, that the presence of vessels in the D18 palace is consistent with the remainder of the Syro-Palestinian evidence.

Temples

Significantly, vessels only occur at temple sites in D19 contexts, with examples at Beth Shan, Lachish and Deir 'Alla. While Deir 'Alla has only a single glass vessel it is worth remarking on the concentration of vessels at Beth Shan and Lachish. Excluding the Kamid el-Loz evidence as potentially biased due to squatter activity, such concentrations are unrepresented elsewhere in Syro-Palestine. Indeed, in Egypt, such concentrations are unparalleled outside the production centres and sites clearly connected to the Egyptian court. It does, of course, raise obvious parallels with the Sinai sites, Serabit el-Khadem and Timna where glass also occurs in temples (see Chapter 11).

It may be argued, then, that the contextual distribution of glass vessels in Syro-Palestine shows a broad division in chronological terms, with D18 vessels occurring in tombs and their distribution in temples confined to D19. Such a division may be representative of the manifestation of Egyptian power in Syro-Palestine during the New Kingdom. That vessels are to be linked to the governing classes is suggested by the occurrence of vessels in 'official' contexts in both D18 and 19. Given that this period witnessed a significant transformation of Egyptian relations with Syro-Palestine it may be argued that the distribution of the vessels represent

this political change.

Political Conditions

Before considering this interpretation it is important to briefly describe the role of Egypt in this area in the Late Bronze Age. For the whole of the Late Bronze Age, Egypt can be described as the culturally dominant force in the area, although in the North this influence was mitigated by the influence of Hittite and Mittanian culture, for instance in the widespread use of the cylinder seal (Collon 1987, 69-70, 140-1, Teisser 1984, 100-104). The cultural predominance of Egypt was severely weakened at the close of the Bronze Age with the massive upheaval of the period conventionally associated with the arrival of the 'Sea Peoples' (Sandars 1985, 105ff). In the Iron Age, Syro-Palestine was typified by the emergence of several local cultures, influenced by many different traditions. For the period from Tuthmosis IV - Ramesses III, then, Egypt was the culturally dominant power. During this period, political control of the area was also exerted by Egypt, and it is important to distinguish the two ways in which this control was exercised (Kitchen 1982, 10-13, Liverani 1979 7, 10-11, Sandars 1985, 45-6, Weinstein 1981, 16-18).

Given that some of the glass vessels in Syro-Palestine may represent hold-overs from the later

D18, it is important to determine the mechanisms of control in this and the following period. The palace archive at Amarna provides a valuable insight into Egypt's relationship with Syro-Palestine during the reigns of Amenophis III and Akhenaten, detailing correspondance between the rulers of the city states and the King. Two interpretations may be applied to the political developments at this time. The letters are primarily concerned with requests for aid, or for certain goods from Egypt, and many describe border disputes and incursions into territory. These letters were used to support the belief that in the later D18 (and particularly under Akhenaten) the Egyptian court began to lose control of its Syro-Palestinian possessions, originally gained in the campaigns of the early D18. There is, perhaps an element of veracity in this interpretation, but as Several (1972) and Weinstein (1981) have argued, the letters also point to a period of established and stable political relations. Summarised, this view holds that the Amarna letters could have only been written in a period when the Pax Aegyptica was largely accepted by the ruling class in Syro-Palestine. It is not the intention here to discuss these divergent views (although the second appears more commendable), but rather to note one significant feature of the Amarna correspondance, that of the devolution of power to the local rulers. This is apparent in the letters of one particularly troublesome governor

discussed by Liverani (1979, 3-11).

In the following period, D19 and early Ramesside, this local autonomy was largely abolished in political terms, with Egypt taking on a more direct and militaristic role (Kitchen 1982, 67-70, Sandars 1985, 115-116, Weinstein 1981, 18). This period saw the establishment of Egyptian garrisons at several sites in Palestine, to cite just two examples at Beth Shan (Weinstein *ibid*) and Deir el-Balah (Dothan 1985, 61-2), and the fortification of the main route through the area. There were also several military campaigns in Palestine, notably those of Seti I, Ramesses II and Ramesses III, testified both in monumental stelae in Palestine and in Egyptian reliefs, most famously those of the Medinet Habu of Ramesses III (for refs see Porter and Moss II 101f)(which may themselves represent the campaigns of earlier expeditions!). In part, the direct control of Syro-Palestine by Egypt may have been necessitated by the wars with the Hittites following the breakdown in political relations between the two empires post Amarna. Such direct control, while providing a greater level of involvement, may also have been in practice more localised to those areas where Egyptian troops were present.

Thus the LBII period in Syro-Palestine saw two types of Egyptian political control, indirect during the later D18 and direct control during D19 - early D20. It is against this cultural background that the

distribution of the glass vessels must be interpreted.

From an analysis of the contextual information, it may be suggested that the distribution of the vessels is directly related to the form of political control practised by the Egyptians. This may be supported if it is accepted that the elaboration of tombs, and tomb goods, may be linked to individual prestige within a society, a reasonable assumption and one which appears valid for Late Bronze Age Syro-Palestine. (Bienkowski 1986, Gonen 1984, 1985). Similarly, it may be suggested that the temples are to be connected to communal rather than individual activity. Thus the different patterns of distribution may represent the transfer of power (real or symbolic) from individuals to institutions.

Before considering the proposition that the distribution of the vessels reflects the dominant political ideology, it is essential to establish that vessels may reasonably be equated with the higher echelons of society. In terms of this interpretation, an analysis may be made of the contexts in which vessels occur, based on the recognition of certain features as indicative of status. High status will in turn be taken as indicative of political power. Within the political context of Late Bronze palatial bureaucracy, this is a reasonable assumption from which to proceed.

Status Analysis

That the temples as institutions held high status is indisputable given the social investment represented in these buildings, in physical terms by their size and architectural elaboration. The associated artefacts also confirm this, with particularly rich deposits at Beth Shan and Lachish, including faience vessels, ivories and other exotic or rare artefacts. While not as apparently wealthy, at Deir 'Alla, the range of goods, again including faience, and an ivory (?) comb, suggests relatively high status. Finally, while there is no detailed understanding of the extent of popular participation in religion, the surviving evidence suggests that there was generalised respect for temples, this would tend to confirm their relative importance.

Almost by definition 'official' contexts may be connected to the governing classes. Given the function of both the Megiddo Mittelburg/5020 complex as a palace and the evidence concerning the administrative function of the building at Tell esh-Sharia, the association of the vessels in these cases with government seems proven.

In order to assess the status of the other contexts, the tombs and Megiddo 1787, an examination was made employing a method similar to that used for the interpretation of the evidence from Gurob and Amarna above (Chapters 8 & 9). Several features were used to assess the contexts' status, principal amongst them an

analysis of the associated types of artefacts. Access to a wide range of material types and the presence of exotic, particularly elaborate, or rare artefacts (exclusive of glass vessels) were taken as indicative of high status. With respect to the tombs, elaboration of structural elements, and their physical size were also employed as indicators, but, unlike at Gurob, subjectively due to the restrictions of this study.

For a detailed analysis of the relative status of the tombs in Syro-Palestine in which vessels occur, it would have been necessary to compare each site in Syro-Palestine at a single context level, such a task is beyond comprehension. Even to have undertaken it for only the sites at which vessels were present is beyond feasibility for the current work. It was therefore necessary to compare the evidence of artefact distribution relative to a known pattern, and for reasons of convenience, the material from Gurob was utilised. As Syro-Palestinian culture has distinctive traits from that of Egypt, this does not provide a directly parallel situation for comparative purposes. In terms of the cross cultural value of status objects however, the internationalism of the LBII makes such an assessment reasonable.

In terms of the elaboration of the structure and size of the tombs, it was not possible to provide an order of rank based on their structural characteristics, again because of the remit of this work, therefore these

criteria will only be cited where evidence exists that a particular tomb had exceptional features. Thus, the evaluation of the status of the tombs is less precise than might be desired. The indicators, however, do suggest that the majority of the tombs were of high status and consequently may be linked to the upper echelons of society.

The Status Of The Tombs

In terms of the range of materials represented in the tombs at Gurob (see Chapter 8), and following Crocker (1985, 54) in defining high status as the top 10% of society, high status is to be equated with the presence of three or more material types. In Syro-Palestine, two tombs (Tell el-'Ajjul 1035 and 1514) have 3 material types, while there are four examples (Tell el-'Ajjul 1037 and 'Governor's Tomb', Dharat el-Humraiya 8 and Minet el-Beida VI) which have 5 material types, such a range represented in only 1% of the Gurob tombs. On the evidence of the number of material types represented in the tombs, only Gezer (Sarah) might reasonably be classed as poor, with the majority having high status in terms of the comparative distribution at Gurob.

From the examination of the types of artefacts represented in the Gurob tombs, it may be suggested that certain types may be indicative of high status. At

Gurob, metal objects were relatively scarce. Significantly metal objects are present in many of the Syro-Palestine tombs. Of particular note are the occurrence of bronze jewelry in Ain Shems Tomb 11, an iron bracelet in Ain Shems 31, bronze objects including a copper dagger and arrowheads in Tell el-'Ajjul Tomb 1514 and toggle pins, ear-rings and small implements at Tell 'Eitun. The relative wealth of the tombs is further reinforced by objects of precious metal being present in several tombs, for instance, particular mention may be made of the considerable quantities of gold jewelry at Dharat el-Humraiya Tomb 8 and the presence of a silver ram in Tel el-'Ajjul 1037. The types of artefacts, then seem to reinforce the identification of the tombs as high status.

In terms of the structural elaboration and size of the tombs, three are worthy of comment, the 'Governor's Tomb' at Tell el-'Ajjul, Minet el-Beida Tomb VI and Tell 'Eitun. The 'Governor's Tomb' is exceptional in that it has a built superstructure, although this may have been added after the deposition of the vessels. Tomb VI is exceptionally large, being nearly double the size of the other examples at Minet el-Beida. Moreover, the presence of tubes leading into the tomb may imply that this tomb also held a ritual significance. (Schaeffer suggested that the tubes may have been used for libations.) Finally, while Tell 'Eitun appears poor by comparison to the D18 graves, a possible suggestion of the relative

wealth of the owner of the vessel is indicated by its find spot. (Accepting that this vessel was interred with a specific individual.) The vessel was found in an area which had been paved suggesting social differentiation within the burials in the cave. This does not of course necessarily indicate high status within the broader society, but coupled with the other evidence described above is suggestive.

Only one tomb, Gezer (Sarah), may confidently be described as a relatively poor burial, with the majority of the tombs consistently appearing as high status. It is reasonable to infer from this that their occupants are to be linked to the governing élite (in the broadest sense) in Syro-Palestine.

Megiddo 1787, a general deposit in a residential area was compared with the settlement debris as represented at Amarna, in terms of the number of material types present (see Chapter 9). In terms of the definition of status at Amarna this context, with four material types may be considered as high status. The presence of faience bowls and ivory objects in Megiddo 1787 would seem to confirm this attribution of high status.

The Distribution of Glass Vessels-Summary

The contextual distribution of the vessels seems to show two distinct patterns.

In D18 in Syro-Palestine, glass vessels occur principally as single (at most dual) examples, in the tombs of higher status individuals. They also occur in 'official' buildings in this period. This distribution is reminiscent of that in Egypt (see Chapter 10) where the vessels occur primarily as personal possessions in this period. In both areas, it is reasonable to assume, given the political structure of society, that these individuals are to be connected to the ruling classes.

In D19 a new phenomenon appears, with the absence of proven Egyptian vessels in tombs, and the presence of glass vessels in temples. (Although two tombs are known at this date, at both Tell 'Eitun and Minet el-Beida Tomb VI there is evidence to suggest that both the vessels were Cypriot, and that neither was particularly subject to Egyptian influence.) The site of Tell esh-Sharia establishes that vessels were also found in association with Egyptian administration in D19.

It seems then, that there was a genuine change in the distribution of glass vessels at the close of D18.

Possible Explanations For The Distribution Of The Vessels

An understanding of the temples in which the vessels occur in D19 is crucial to an understanding of the distribution of the vessels.

In advance of the publication, little is known

concerning Deir 'Alla, but it is apparent that it does not represent a parallel situation to the temples at Beth Shan and Lachish. It is important to note the similarities between the temples at the latter two sites. This is visible both in the layout of these temples; the general plans are the same, the altars are similarly located and at both are 4 column bases arranged in a square in the altar room. There are also parallels in the range of artefacts represented at the sites, particularly the considerable quantities of faience and glass of typologically Egyptian form. These sites are also atypical for Syro-Palestine in the concentration of several glass vessels in a single context. This situation is paralleled in the Sinai sites of Serabit el-Khadem and Timna, where a similar range of artefacts further suggests cultural links to Beth Shan and Lachish. Unlike the Sinai sites which were devoted to the Egyptian goddess Hathor (see Chapter 11), both Beth Shan and Lachish were dedicated to local deities. At Beth Shan the deities appear to be Mekal and Antit. At Lachish a triad of deities including Reshef and Elath appear to have been worshipped. Despite this, there are reasons to show how the Beth Shan and Lachish temples do represent direct parallels to the Sinai sites. Of obvious mention is the fact that both were directly under Egyptian control and this is reflected in the layout of the temples, with parallels to the Beth Shan and Lachish temples in the mortuary chapels at Amarna,

and in the considerable quantities of Egyptian artefacts. Ideological links also associated these temples with Hathor, as the goddess of foreign lands, and there are objects associated with Hathor in these temples. At Lachish there is a ring with a depiction of Hathor, while at Beth Shan a clapper with a depiction of this goddess suggests the possible incorporation of Egyptian ritual. The clapper is paralleled in the Sinai sites, and may have been used by the priest in a dance ceremony. Finally, the temples are broadly contemporary.

An explanation for the presence of vessels in these temples in D19 may be sought in the political changes, described above, which accompanied this period

Any explanation for the distribution of vessels in terms of Egyptian court ideology proceeds from several assumptions. First that glass vessel production was a royal monopoly in Egypt (see Chapters 4,7 & 10). Second, that post-Amarna there is a shift in the scale of production to a smaller scale after the expansion under Akhenaten. This shift in Egypt seems to accompany a transfer in the social function of the glass vessels; in D18 they seem to have been relatively widely distributed (possibly directly by the court) to individuals with court contacts, the members of the upper echelons of society. In D19, however, the vessels were more restricted, and associated with institutions under the direct control of the Egyptian court. Third, in an economy in which the importance of demand was negligible

the availability of the vessels was determined by the supplier, in this case the Egyptian court. Finally, that a major ideological shift in the nature of Egypt's political relations with Syro-Palestine, as discussed above, accompanied this period and influenced the distribution of court produced items.

The explanations offered below seek to understand the majority of the vessels in terms of the change in social function of the vessels from items of personal status to their emergence as symbols of communal power in religious contexts. Neither of the explanations advanced accounts for the association of a glass vessel with an impoverished burial, Gezer (Sarah), nor does it fully account for the Tell 'Eitun or Minet el-Beida examples. In the case of the latter two examples, explanation may centre on different patterns of distribution connected with a probable Cypriot glass industry. In the absence of detailed analysis of the distribution in Cyprus, however, this is merely a suggestion of a possible avenue of investigation, rather than an observation based on empirical evidence.

Glass Vessels As Markers Of The Form Of Political Power

This interpretation explains the similarity between the distribution of glass vessels in D18 Syro-Palestine and Egypt with reference to the system of political control. In both areas, the evidence suggests

that vessels were primarily personal possessions of high status individuals, as represented by their inclusion in wealthy tombs. As vessels were unavailable outside the royal monopoly it is reasonable to suggest that they functioned as items of reward for the administrators of Egyptian rule in Syro-Palestine. Weinstein (1981, 16) has described how the élite within Syro-Palestine were largely autonomous, although respecting Egyptian authority and the necessity of Egypt maintaining good relations with the semi-autonomous governments in Syro-Palestine is well documented in the Amarna letters. It appears reasonable to suggest that glass vessels may have served as 'incentives' to maintain the support of the ruling élites in Syro-Palestine in D18.

In D19, the political system underwent a fundamental shift as troops were garrisoned and Egypt assumed direct control (Weinstein 1981, 18). The Egyptian bureaucracy was thus less concerned with the support of the élite, but rather in maintaining control over the general population. Hence, the distribution of exotic goods to local rulers was no longer an Egyptian priority, and it is significant that glass vessels are no longer common as grave goods. Indeed, both the D19 burials, Minet el-Beida Tomb VI and Tell 'Eitun contain vessels which are typologically un-Egyptian. In the case of Minet el-Beida, the independence of the city's rulers continued until its destruction by the 'Sea Peoples'. There is, however, no obvious explanation to account for

Tell 'Eitun.

The concentration of glass vessels in D19 contexts must be seen in relation to the heavily Egyptianised nature of the temples in which they occur. At both Beth Shan and Lachish there is evidence that the Egyptians had a direct role in the running of the temples. McGovern (1991, 20) has suggested that the favour heaped on the temples, particularly the provision of vitreous materials at Beth Shan, was a display of Egyptian power. Certainly, vitreous materials, with their bright colours, would seem to be extremely useful as highly visible symbols of Egyptian domination of the temple. It may also be that the finds from Beth Shan and Lachish may partly be related to the direct administration of the temples, as in the examples of Serabit el-Khadem and Timna. Given their dedication to local deities, however, this seems less appropriate than for the Sinai sites.

At its simplest level this explanation sees the glass vessels as expressions of Egyptian political power. In D18 they functioned as items of reward, while in D19 they became expressions of domination.

Ideological Explanations

This explanation draws particularly on the association of concentrations of glass vessels at Serabit el-Khadem and Timna as a parallel situation to Beth Shan and Lachish. While the interpretation of the

D18 distribution pattern still stresses the importance of a local semi-autonomous elite, the explanation for the D19 examples depends on ideological considerations. If, as is argued above, the reign of Akhenaten was associated with an expansion of the glass industry, as seems the case, then it may be that it was primarily due to religious motivation that D19 distribution shows a shift towards the temples. The particular iconographic reasons in support of such an assertion have been discussed above (Chapter 11). For the theory to hold true however, it would be necessary for the temples to have placed a greater emphasis on the worship of Hathor than appears the case. Despite objects associated with the Hathor cult being present at both sites, there is no evidence for the direct worship of the goddess. (Unless the Beth Shan clapper may be taken as evidence of such.)

However, this does not invalidate the observation that glass vessels do seem to assume some religious significance in D19, with examples from five temples and in Egypt their occurrence in the 'house-deposits' of Gurob, which appear ritual in nature. Significantly too, the earliest example of vessels in ritual contexts is outwith Egypt, in Serabit el-Khadem and possibly too at Lachish. This may represent cultural influence from Syro-Palestine on Egypt. In such an argument, it is necessary to prove the existence of such a tradition outside direct Egyptian control, such a pattern may be represented in Cyprus eg. the finds from Kition, but is

not evident in Syro-Palestine. Given the complexity of LBII society, and the level of shared economic, social and political involvement a sole origin for new customs may be impossible to identify.

Any argument which seeks to understand the motivation behind the distribution of particular types of artefacts must by its nature be highly speculative, but given the very restricted distribution of glass, it does seem a valuable exercise. While the exact interpretation as to the reasons why may elude us, it seems reasonable to conclude that the distribution of glass vessels in Syro-Palestine does reflect the forms of power exercised by the Egyptian court.

Conclusion

Previous studies of Egyptian core-glass vessels have concentrated on two divergent areas; the technology employed in their manufacture and their typological development in terms of their chronology. This work has attempted to integrate these two fields and also to incorporate the evidence from the contextual distribution of the vessels. The main objective of this thesis was to assess the social status of the vessels and their social function, in both archaeological and contemporary terms. The evidence discussed above suggests that vessels may be directly linked to the Egyptian court. Furthermore, it appears that the vessels' distribution is a reflection of the dominant ideological considerations of contemporary Egyptian politics.

The Production Of The Vessels

it has been generally accepted that the production of glass vessels was a royal monopoly, despite little scrutiny of this proposition. The analysis of the technology employed in vessel production, and the distribution of manufacturing debris discussed in this work, do confirm this view.

The production of glass per se has several requirements, which, in the context of New Kingdom

society, could only be filled through the palace system. Of particular relevance is the necessity of access to a wide range of metals, in small quantities, for use in the generation of colour, with the trade in metals dominated by the court. Furthermore, certain colourants such as cobalt, could only have been obtained by the court, and were not in general circulation. It thus seems reasonable to conclude that the technology of glass production was dependent on the court.

This is further reinforced by the evidence that specialist skills were required to produce glass and to form and decorate the vessels. Glass working is dependent on a controlled chemical and pyrotechnical technology, and the production of a consistent range of colours argues for an understanding of the properties of glass. Such knowledge is indicative of craft specialisation. Moreover, with respect to the vessels, the typological consistency of the majority of the examples, in both form and decoration, argues for distinct canons of vessel production, again indicative of craft specialisation. In the New Kingdom, such specialist workers were attached to major institutions, either the palace or the temples. (The temples themselves being largely dependent on the palace.)

The distribution of known production centres is highly restricted, with only three sites unequivocally identified, Malqatta, Amarna and el-Lisht. While the last is very poorly understood, both Malqatta and Amarna

are intrinsically linked to royalty by the presence of palaces associated with the 'Window of Appearance' employed in festivals by Akhenaten. This link between the court and vessel production is reinforced by the distribution of production debris at Amarna. An examination of the evidence from this site shows that manufacturing debris, and indeed, finished vessels, are principally concentrated in the area of the Central City, adjacent to the main royal buildings of the King's House and Great Palace. Of great relevance is the association of the vessels with the former building, a complex used by the king for the storage and distribution of gifts in grandiose ceremonies. Thus, the distribution of debris associated with the manufacture of vessels strongly supports the suggestion that glass vessel production was a royal monopoly.

Social Status

The existence of a royal monopoly of glass vessel production suggests that they are to be considered as high status objects. This interpretation is supported by other evidence. The typology of the vessels for instance illustrates this point, for most of the forms employed are imitative of vessels in other materials which are either imports or with vessels which of Egyptian forms in metal or stone which may be linked to higher status. Similarly the colours of glass employed may have been

influenced by semi-precious stones, for example the dark blue colour is suggestive of lapis lazuli. Moreover, in functional terms, the small size of the vessels tends to preclude any significant role for the vessels as containers, especially when coupled with the levels of input required for their manufacture.

The relative scarcity of the vessels, too, also supports the attribution of high status to the vessels. This is also apparent in the contextual distribution of the vessels. At both Amarna and Gurob, the vessels are principally to be associated with contexts which are indicative of higher status. The status of the contexts may be inferred from a number of features; the associated artefacts, architectural elaboration and the function of the buildings. At both sites the vessels are concentrated in areas of royal activity; in the King's House/Great Palace area at Amarna, and in the 'house-deposits' of the Harim Palace at Gurob.

An examination of the wider distribution of the vessels further reinforces their high status value. In Egypt, glass vessels principally occur as objects accompanying high status burials, often in tombs of individuals who may be directly linked to the court. The distribution of the vessels in Sinai and Syro-Palestine also illustrates the high status of the vessels. In these areas they occur in temples (which may have been controlled directly by the Egyptian court) and in burials with other evidence of high status. Again the

evaluation of the status of these contexts is based on the associated artefacts, architectural elaboration and where possible, inscriptional evidence.

The evidence, then, does support the assertion that the glass vessels held intrinsic high status.

The Social Function Of The Vessels

The chronological distribution of the vessels suggests that post-Amarna a change in their social function occurred. In the later D18, the distribution of the vessels, primarily in tombs and court buildings, suggests that they were primarily personal possessions. Given their association with the court this may indicate that they functioned as items of personal reward. A suggestion which gains support from the textual evidence of the largesse of Akhenaten, and his elaboration of the Sed festival. In D19, however, the distribution of the vessels becomes more restricted and a new pattern becomes dominant, the association of vessels with ritual contexts. This is evident in the concentration of vessels in temples in Sinai Syro-Palestine, and also in Egypt at Gurob, where the vessels appear in the 'house-deposits'. It appears that vessels may have assumed greater significance as items displaying the power of the court.

Such a suggestion gains credence when considered against the background of the political developments of

the Late Bronze Age. Both textual and archaeological evidence indicate that the period post-Amarna shows significant shifts in Egyptian ideology. While the later D18 had allowed a degree of autonomy to local rulers, in D19 there is a greater concentration of direct power in the Egyptian court. This power was expressed in a greater degree of court patronage of the institutions of bureaucratic power, which in Sinai and Syro-Palestine is shown by the ideological manipulation of the local temples by the Egyptians. Thus, glass vessels, and potentially other luxury objects were supplied to temples rather than to individuals. It thus appears that the distribution of glass vessels is to be directly associated with the form of political power exercised by the Egyptian court. This suggestion is consistent with the domination of the trade in luxury items by the palace system in the Late Bronze Age.

Limitations

The interpretations advanced above are consistent with the available evidence, but certain reservations must be noted. As with any study of the Near East, this work is dependent on evidence which is known to be incomplete, and while not invalidating this work, it does present bias. Particularly when note is taken of the preference of archaeological work to concentrate on impressive monumental structures with rich finds, rather

than more mundane human activity.

Moreover, there are two specific problems which when fully addressed may radically alter the interpretations offered here. First is the poorly understood nature of the site of el-Lisht, a known production site in Egypt. Studies are currently in hand to fully appraise this material, and it is possible that this site will provide evidence of non-royal production. Until this material is fully understood, however, it would be foolhardy to overstress its significance, especially in light of the other evidence.

The second major problem is the presence of glass vessels in Cyprus in significant numbers. This is of particular relevance for the analysis of the distribution of vessels in Syro-Palestine. While the author contends that an independent industry existed in Cyprus, no full study of the material has been presented here, nor has such a study been undertaken. It is of crucial importance that a consensus is achieved as to whether such an independent industry did exist. Hopefully, some enterprising scholar will attempt to review the Cypriot material, but until that point, any argument which proceeds from an assumption of independent manufacture, as that advanced here, is open to criticism.

These reservations made, however, it is reasonable to conclude that the present study does illustrate the importance of glass vessels as markers of Egyptian court

activity. It also shows that, within the internationalism of the Late Bronze Age, certain types of luxury objects were consistent in terms of their status and social function, with these aspects being determined by their originating culture rather than being locally defined.

Abbreviations

- AJA American Journal Of Archaeology.
- ARI-V KEMP B J Amarna Reports I-V
- Arch. Report Annual Report Of The Egyptain Excavation Fund
- ASAE Annales De La Service Archéologie D'Egypte.
- BASOR Bulletin Of The American School Of Oriental Research
- B&E BRUNTON G & ENGELBACH R 1927 Gurob London.
- Bib. Or. Bibliotecha Orientalis
- BMMA Bulletin Of The Metropolitan Museum Of Art
- COA:I PEET T E & WOOLLEY L 1923 The City Of Akhenaten Part I London.
- COA:II FRANKFORT H & PENDLEBURY J D S 1933 The City Of Akhenaten Part II London.
- COA:III PENDLEBURY J D S 1951 The City Of Akhenaten Part III London.
- FFSV PETRIE W M F 1937 Funeral Furniture And Stone Vases London.
- FIFAO Fouilles de L'Institute Français D'Archéologie Orientale Du Caire
- Glas. NOLTE B 1968 Die Glasgefasse In Alten Aegypten Berlin.
- IKG PETRIE W M F 1891 Illahun, Kahun And Gurob London.
- JAOS Jounal Of The American Oriental Society
- JEA Journal Of Egyptian Archaeology

JGS Journal Of Glass Studies

JNES Journal Of Near Eastern Studies

JSGT Journal Of The Society Of Glass Technology

KGH PETRIE W M F 1890 Kahun, Gurob And Hawarra
London.

LOAT LOAT L 1905 Gurob in M MURRAY Saqqara Mastabas
I London 1905.

PEQ Palestine Excavation Quarterly

PM PORTER B & MOSS R Egyptian Topographical Lists

RDAC Report Of The Department Of Antiquities Cyprus.

TEA PETRIE W M F 1894 Tell El Amarna London.

ZAS Zeitschrift fur Ägyptische Sprache

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- BARSANTI A 1902b Rapport Sur la Fouille De Dachour ASAE 3.
- BARSANTI A 1908a Fouilles de Zaouiét el-Aryân ASAE 8.

- BARSANTI A 1908b Rapport Sur Les Travaux Du Grand Temple D'Edfou ASAE 8.
- BARSANTI A 1908c Rapport Sur La Découverte à Edfou Des Ruines D'un Temple Ramesside ASAE 8.
- BARSANTI A 1919a Rapport Sur Les Travaux Exécutés à Saqqarah ASAE 18.
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